

### Prep Standard - Chemical Standard Summary

Order ID : P4615

Test : Metals Group3

Prepbatch ID : PB164563,

Sequence ID/Qc Batch ID: LB133257,LB133257,LB133296,LB133296,LB133344,

### Standard ID :

MP73080,MP81119,MP83078,MP83078 MP83079 MP73080 MP83081 MP83082 MP83084,MP83083,MP83085,MP83086,MP83086 MP83087,MP83088,MP83091,MP83091 MP83092,

### Chemical ID :

M5130,M5192,M5218,M5223,M5288,M5295,M5296,M5390,M5394,M5404,M5429,M5467,M5498,M5515,M5585,M5634 ,M5658,M5697,M5698,M5747,M5748,M5769,M5798,M5799,M5800,M5801,M5802,M5806,M5814,M5815,M5816,M581 7,M5818,M5819,M5820,M5875,M5935,M5962,M5970,M5978,M5982,M5984,M5985,M6000,M6009,M6021,M6023,M60 28,M6030,M6033,M6095,M6111,M6113,M6117,W2606,W3112,



| Recipe<br>ID<br>903 | NAME<br>ICP AES RINSE SOLN       | <u>NO.</u><br>MP73080 | Prep Date<br>12/27/2022 | Expiration<br>Date<br>01/08/2023 | <u>Prepared</u><br><u>By</u><br>Bin He | <u>ScaleID</u><br>None | <u>PipetteID</u><br>METALS_PIP<br>ETTE_3 (A) | Sarabjit Jaswal |
|---------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|----------------------------------------|------------------------|----------------------------------------------|-----------------|
| <u>FROM</u>         | 200.00000ml of M5404 + 9800.0000 | oml of W260           | )6  = Final Qu          | antity: 10000.00                 | 00 ml                                  |                        |                                              |                 |
|                     |                                  |                       |                         |                                  |                                        |                        |                                              |                 |
|                     |                                  |                       |                         |                                  |                                        |                        |                                              |                 |
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| <u>Recipe</u> |                                   |                |               | Expiration      | Prepared       |                |                   | Supervised By   |
|---------------|-----------------------------------|----------------|---------------|-----------------|----------------|----------------|-------------------|-----------------|
| <u>ID</u>     | NAME                              | <u>NO.</u>     | Prep Date     | <u>Date</u>     | <u>By</u>      | <u>ScaleID</u> | PipettelD         | Sarabjit Jaswal |
| 169           | 1:1HNO3                           | <u>MP81119</u> | 06/21/2024    | 04/24/2025      | Al-Terek Isaac | METALS_SCA     | METALS_PIP        |                 |
|               |                                   |                |               |                 |                | LE_2 (M SC-2)  | ETTE_1 (ICP<br>A) | 06/21/2024      |
| FROM          | 1250.00000ml of M5935 + 1250.0000 | 00ml of W26    | 606 = Final Q | uantity: 2500.0 | 00 ml          |                | ,,,               |                 |
|               |                                   |                |               |                 |                |                |                   |                 |
|               |                                   |                |               |                 |                |                |                   |                 |
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| Recipe<br>ID<br>902 | NAME<br>ICP AES CAL BLK ( SO/ICB/CCB) | <u>NO.</u><br>MP83078 | Prep Date<br>11/06/2024 | Expiration<br>Date<br>12/06/2024 | Prepared<br>By<br>Kareem<br>Khairalla | <u>ScaleID</u><br>None | PipetteID<br>None | Sarabjit Jaswal |
|---------------------|---------------------------------------|-----------------------|-------------------------|----------------------------------|---------------------------------------|------------------------|-------------------|-----------------|
| FROM                | 125.00000ml of M6111 + 2350.00000     | )ml of W311           | 2 + 25.00000            | ml of M6117 =                    |                                       | 2500.000 ml            |                   |                 |
|                     |                                       |                       |                         |                                  |                                       |                        |                   |                 |
|                     |                                       |                       |                         |                                  |                                       |                        |                   |                 |
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|                     |                                       |                       |                         |                                  |                                       |                        |                   |                 |
| Recine              |                                       |                       |                         | Expiration                       | Prepared                              |                        |                   | Supervised By   |

| <u>Reci</u><br>ID |                                                                                                                                                                                                                                                                            | <u>NO.</u>                                                            | Prep Date                                                    | Expiration<br>Date                                                   | <u>Prepared</u><br><u>By</u>                                         | <u>ScaleID</u>                                                       | <u>PipetteID</u>                                                 | <u>Supervised By</u><br>Sarabjit Jaswal |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------|
| 295               | 50 ICP AES S1/CRI STOCK STD                                                                                                                                                                                                                                                | <u>MP83083</u>                                                        | 11/06/2024                                                   | 12/06/2024                                                           | Kareem<br>Khairalla                                                  | None                                                                 | None                                                             | 11/07/2024                              |
| FRC               | DM         0.03000ml of M5798 + 0.03000ml of of M6033 + 0.06000ml of M5747 + 0.0.10000ml of M5962 + 0.10000ml of of M5799 + 0.20000ml of M5819 + 0.0.50000ml of M5390 + 0.50000ml of M5390 + 0.50000ml of M5769 + 1.00000ml of M5806 + 1 MP83078 = Final Quantity: 100.000 | .10000ml of<br>M5970 + 0.<br>.20000ml of<br>M5814 + 1.<br>.00000ml of | M5697 + 0.10<br>10000ml of M<br>M6021 + 0.20<br>00000ml of M | 0000ml of M569<br>5982 + 0.15000<br>0000ml of M602<br>5192 + 1.00000 | 98 + 0.10000ml<br>0ml of M5800 +<br>23 + 0.25000ml<br>0ml of M5288 + | of M5801 + 0.1<br>0.20000ml of M<br>of M5467 + 0.2<br>1.00000ml of M | 0000ml of M58<br>5748 + 0.2000<br>5000ml of M58<br>5498 + 1.0000 | 820 +<br>00ml<br>802 +                  |



| Recipe<br>ID<br>912 | NAME<br>ICP AES ICV SOLN                                              | <u>NO.</u><br>MP83085 | Prep Date<br>11/06/2024 | Expiration<br>Date<br>12/06/2024 | Prepared<br>By<br>Kareem<br>Khairalla | <u>ScaleID</u><br>None | PipetteID<br>None | Sarabjit Jaswal |
|---------------------|-----------------------------------------------------------------------|-----------------------|-------------------------|----------------------------------|---------------------------------------|------------------------|-------------------|-----------------|
| FROM                | 0.02500ml of M5429 + 0.02500ml of<br>of M5295 + 89.77500ml of MP83078 |                       |                         |                                  | )ml of M5218 +                        | 0.25000ml of N         | 15982 + 10.000    | )00ml           |

| <u>Recipe</u><br><u>ID</u><br>904 | NAME<br>ICP AES ICSA SOLN             | <u>NO.</u><br>MP83086 | <b>Prep Date</b><br>11/06/2024 | Expiration<br>Date<br>11/19/2024 | <u>Prepared</u><br><u>By</u><br>Kareem<br>Khairalla | <u>ScaleID</u><br>None | <u>PipetteID</u><br>None | Sarabjit Jaswal |
|-----------------------------------|---------------------------------------|-----------------------|--------------------------------|----------------------------------|-----------------------------------------------------|------------------------|--------------------------|-----------------|
| <u>FROM</u>                       | l<br>25.00000ml of M5130 + 225.00000m | l of MP8307           | /8 = Final Qu                  | antity: 250.000                  |                                                     |                        |                          | 11/07/2024      |
|                                   |                                       |                       |                                |                                  |                                                     |                        |                          |                 |
|                                   |                                       |                       |                                |                                  |                                                     |                        |                          |                 |
|                                   |                                       |                       |                                |                                  |                                                     |                        |                          |                 |
|                                   |                                       |                       |                                |                                  |                                                     |                        |                          |                 |
|                                   |                                       |                       |                                |                                  |                                                     |                        |                          |                 |
|                                   |                                       |                       |                                |                                  |                                                     |                        |                          |                 |



| Recipe<br>ID<br>911 | NAME<br>ICP AES CCV SOLN         | <u>NO.</u><br>MP83088 | Prep Date<br>11/06/2024 | Expiration<br>Date<br>12/06/2024 | <u>Prepared</u><br><u>By</u><br>Kareem<br>Khairalla | <u>ScaleID</u><br>None | <u>PipetteID</u><br>None | Sarabjit Jaswal |
|---------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|-----------------------------------------------------|------------------------|--------------------------|-----------------|
| FROM                | 50.00000ml of MP83078 + 50.00000 | ml of MP83(           | 079 = Final Q           | uantity: 100.00                  | 0 ml                                                |                        |                          |                 |

| <u>Recipe</u><br><u>ID</u> | NAME                              | <u>NO.</u>     | Prep Date   | Expiration<br>Date | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | <u>Supervised By</u><br>Sarabjit Jaswal |
|----------------------------|-----------------------------------|----------------|-------------|--------------------|------------------------------|----------------|------------------|-----------------------------------------|
| 919                        | ICP AES INTERNAL STD              | <u>MP83091</u> | 11/06/2024  | 12/06/2024         | Kareem<br>Khairalla          | None           | None             | 11/07/2024                              |
| FROM                       | 1.00000ml of M5984 + 10.00000ml o | f M5985 + 1    | 969.00000ml | of W3112 + 20      | .00000ml of M6               | 117 = Final Qu | antity: 2000.00  | )0 ml                                   |
|                            |                                   |                |             |                    |                              |                |                  |                                         |
|                            |                                   |                |             |                    |                              |                |                  |                                         |
|                            |                                   |                |             |                    |                              |                |                  |                                         |
|                            |                                   |                |             |                    |                              |                |                  |                                         |
|                            |                                   |                |             |                    |                              |                |                  |                                         |
|                            |                                   |                |             |                    |                              |                |                  |                                         |



| Supplier                    | ItemCode / ItemName                                                          | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|------------------------------------------------------------------------------|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| EPA                         | PART A / ICSA ( ICP )<br>STOCK SOLN                                          | ICSA-1211    | 11/19/2024         | 05/20/2024 /               | 04/20/2021 /<br>bin            | M5130             |
| Supplier                    | ItemCode / ItemName                                                          | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57042 / Mo, 1000 PPM,<br>125 ml                                              | 051722       | 05/17/2025         | 07/01/2022 /<br>bin        | 06/17/2022 /<br>jaswal         | M5192             |
| Supplier                    | ItemCode / ItemName                                                          | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CHEM-QC-4 /<br>CHEM-QC-4, Second<br>Source, 1000 ug/ml, B, Mo,<br>Si, Sn, Ti | S2-MEB711674 | 11/02/2026         | 07/01/2022 /<br>bin        | 09/10/2021 /<br>bin            | M5218             |
| Supplier                    | ItemCode / ItemName                                                          | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| EPA                         | PART B / ICSAB ( ICP )<br>STOCK SOLN                                         | ICSB-0710    | 11/19/2024         | 05/20/2024 /               | 04/20/2021 /<br>bin            | M5223             |
| Supplier                    | ItemCode / ItemName                                                          | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58119 / K, 10000 PPM,<br>500 ml                                              | 071122       | 07/11/2025         | 09/01/2022 /<br>jaswal     | 07/21/2022 /<br>jaswal         | M5288             |
| Supplier                    | ItemCode / ItemName                                                          | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| EPA                         | ICV-1 / ICV (ICP/ICPMS)<br>STOCK SOLN                                        | ICV-1014     | 02/05/2025         | 08/07/2024 /<br>jaswal     | 02/20/2020 /<br>bin            | M5295             |



| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------------------------------|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic<br>Ventures       | Z9651Q /<br>CHEM-CLP-4/.25L                              | S2-MEB711673 | 11/02/2026         | 09/19/2022 /<br>jaswal     | 08/20/2022 /<br>jaswal         | M5296             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57056 / Ba, 1000 PPM,<br>125 ml                          | 072122       | 07/21/2025         | 08/07/2024 /<br>jaswal     | 09/18/2022 /<br>bin            | M5390             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CLPP-CAL-3 / CLP CAL<br>SOLUTION #3, 125mL               | T2-MEB714159 | 01/13/2027         | 11/28/2022 /<br>bin        | 09/19/2022 /<br>bin            | M5394             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-9598-34 / Nitric Acid,<br>Instra-Analyzed (cs/4x2.5L) | 22C0462001   | 06/12/2023         | 12/20/2022 /<br>Al-Terek   | 02/11/2022 /<br>Al-Terek       | M5404             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |

| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57103 / Li, 10000 PPM,<br>125 ml | 070622 | 07/06/2025         | 01/30/2023 /<br>bin        | 01/26/2023 /<br>bin            | M5429             |
|                             |                                  |        |                    |                            |                                |                   |

| Supplier                    | ItemCode / ItemName               | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|-----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57058 / Cerium,<br>1000PPM, 100ML | 020623 | 02/06/2026         | 03/06/2023 /<br>bin        | 03/01/2023 /<br>bin            | M5467             |



| Supplier                       | ItemCode / ItemName                       | Lot #   | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|--------------------------------|-------------------------------------------|---------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc.    | 58120 / Ca, 10000 PPM,<br>500 ml          | 031523  | 03/15/2026         | 08/15/2023 /<br>jaswal     | 03/17/2023 /<br>bin            | M5498             |
| Supplier                       | ItemCode / ItemName                       | Lot #   | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.    | 58126 / Fe, 10000 PPM,<br>500 ml          | 092122  | 09/21/2025         | 08/01/2024 /<br>Jaswal     | 03/17/2023 /<br>bin            | M5515             |
| Supplier                       | ItemCode / ItemName                       | Lot #   | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| PCI Scientific<br>Supply, Inc. | 26397-103 / PTFE<br>BOILING STONES        | W126678 | 02/28/2025         | 01/20/2024 /               | 06/12/2023 /<br>jaswal         | M5585             |
| Supplier                       | ItemCode / ItemName                       | Lot #   | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| PCI Scientific<br>Supply, Inc. | 1403 / Hydrogen Peroxide,<br>30% 1 gal    | 820803  | 02/03/2025         | 04/18/2024 /               | 08/03/2022 /<br>Al-Terek       | M5634             |
| Supplier                       | ItemCode / ItemName                       | Lot #   | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.    | 58024 / Chromium, Cr,<br>500 ml, 1000 PPM | 060523  | 06/05/2026         | 08/28/2023 /<br>jaswal     | 08/25/2023 /<br>jaswal         | M5658             |
| Supplier                       | ItemCode / ItemName                       | Lot #   | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.    | 58029 / Cu, 1000 PPM,<br>500 ml           | 102523  | 10/25/2026         | 04/03/2024 /<br>jaswal     | 10/27/2023 /<br>jaswal         | M5697             |



Standards, Inc.

125 ml

### CHEMICAL RECEIPT LOG BOOK

| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 58025 / Mn, 1000 PPM,<br>500 ml  | 102623 | 10/26/2026         | 04/18/2024 /<br>jaswal     | 10/27/2023 /<br>jaswal         | M5698             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | / Lead (Pb) 1000PPM              | 100923 | 10/09/2026         | 05/20/2024 /<br>Jaswal     | 12/20/2023 /<br>jaswal         | M5747             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | / Nickel (Ni) 1000PPM            | 091223 | 09/12/2026         | 01/02/2024 /<br>bin        | 12/20/2023 /<br>jaswal         | M5748             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58112 / Mg, 10000 PPM,<br>500 ml | 091823 | 09/18/2026         | 05/24/2024 /<br>Jaswal     | 01/03/2024 /<br>bin            | M5769             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57004 / Be, 1000 PPM,<br>125 ml  | 102523 | 10/25/2026         | 02/09/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5798             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57050 / Sn, 1000 PPM,<br>125 ml  | 071123 | 07/11/2026         | 02/09/2024 /               | 02/09/2024 /                   | M5799             |

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### CHEMICAL RECEIPT LOG BOOK

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| Supplier                    | ItemCode / ItemName              | Lot #    | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------|----------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57027 / CO, 1000 PPM,<br>125 ml  | 091923   | 09/19/2026         | 05/31/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5800             |
| Supplier                    | ItemCode / ItemName              | Lot #    | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57033 / As, 1000 PPM,<br>125 ml  | 111323   | 11/13/2026         | 02/09/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5801             |
| Supplier                    | ItemCode / ItemName              | Lot #    | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57051 / Sb, 1000 PPM,<br>125 ml  | 120523   | 12/05/2026         | 08/07/2024 /<br>jaswal     | 01/03/2024 /<br>jaswal         | M5802             |
| Supplier                    | ItemCode / ItemName              | Lot #    | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58111 / Na, 10000 PPM,<br>500 ml | 122223   | 12/22/2026         | 08/01/2024 /<br>Jaswal     | 01/03/2024 /<br>jaswal         | M5806             |
| Supplier                    | ItemCode / ItemName              | Lot #    | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57005 / B, 1000 PPM, 125<br>ml   | 071123   | 07/11/2026         | 03/26/2024 /<br>Sohil      | 01/03/2024 /<br>jaswal         | M5814             |
|                             |                                  | <u> </u> | Expiration         | Data Opened /              | Received Date /                | Chemtech          |

| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57115 / P, 10000 PPM,<br>125 ml | 041723 | 04/17/2026         | 05/21/2024 /<br>Jaswal     | 02/09/2024 /<br>jaswal         | M5815             |
|                             |                                 |        |                    |                            |                                |                   |



| Supplier                    | ItemCode / ItemName                   | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---------------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57016 / S, 1000 PPM, 125<br>ml        | 122923 | 12/29/2026         | 05/20/2024 /<br>Jaswal     | 02/09/2024 /<br>jaswal         | M5816             |
| Supplier                    | ItemCode / ItemName                   | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57116 / S, 10000 PPM,<br>125 ml       | 071123 | 07/11/2026         | 03/01/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal         | M5817             |
| Supplier                    | ItemCode / ItemName                   | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57014 / Si, 1000 PPM, 125<br>ml       | 122023 | 12/20/2026         | 03/06/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal         | M5818             |
| Supplier                    | ItemCode / ItemName                   | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58030 / Zinc, Zn, 500 ml,<br>1000 PPM | 111623 | 11/16/2026         | 03/20/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal         | M5819             |
| Supplier                    | ItemCode / ItemName                   | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57015 / P, 1000 PPM, 125<br>ml        | 091123 | 09/11/2026         | 05/01/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal         | M5820             |

| Supplier              | ItemCode / ItemName                        | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------|--------------------------------------------|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic<br>Ventures | CLPP-CAL-1 / CLP CAL<br>SOLUTION #1, 125mL | T2-MEB714417 | 01/27/2027         | 04/19/2024 /<br>jaswal     | 02/22/2024 /<br>jaswal         | M5875             |



| Supplier                    | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By          | Received Date /<br>Received By        | Chemtech<br>Lot # |
|-----------------------------|----------------------------------------------------------|------------|--------------------|-------------------------------------|---------------------------------------|-------------------|
| Seidler Chemical            | BA-9598-34 / Nitric Acid,<br>Instra-Analyzed (cs/4x2.5L) | 24D1062002 | 12/08/2024         | 06/21/2024 /<br>Al-Terek            | 06/07/2024 /<br>Al-Terek              | M5935             |
| Supplier                    | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By          | Received Date /<br>Received By        | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57034 / Se, 1000 PPM,<br>125 ml                          | 060624     | 06/06/2027         | 07/02/2024 /<br>Jaswal              | 06/14/2024 /<br>Jaswal                | M5962             |
| Supplier                    | ItemCode / ItemName                                      | Lot #      | Expiration         | Date Opened /                       | Received Date /                       | Chemtech          |
| Absolute<br>Standards, Inc. | 57003 / Li, 1000 PPM, 125<br>ml                          | 061224     | Date<br>06/21/2027 | Opened By<br>07/01/2024 /<br>Jaswal | Received By<br>07/01/2024 /<br>Jaswal | Lot #<br>M5970    |

| Supplier              | ItemCode / ItemName                   | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------|---------------------------------------|-------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic<br>Ventures | CGTI1-1 / TITANIUM<br>125mL 1000ug/mL | T2-TI719972 | 06/17/2027         | 08/07/2024 /<br>jaswal     | 02/22/2024 /<br>Jaswal         | M5978             |
|                       |                                       |             |                    |                            |                                |                   |

| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57038 / Sr, 1000 PPM,<br>125 ml | 031524 | 03/15/2027         | 07/01/2024 /<br>Jaswal     | 06/11/2024 /<br>Jaswal         | M5982             |
|                             |                                 |        |                    |                            |                                |                   |

| Supplier              | ItemCode / ItemName                    | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------|----------------------------------------|------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic<br>Ventures | CGY10-1 / YTTRIUM<br>125mL 10,000ug/mL | V2-Y740548 | 02/20/2029         | 08/05/2024 /<br>kareem     | 06/14/2024 /<br>Jaswal         | M5984             |



| Supplier                    | ItemCode / ItemName                                            | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------------------------------------|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic<br>Ventures       | CGIN10-5 / INDIUM 1 x<br>500 ml                                | U2-IN729349  | 02/21/2028         | 10/08/2024 /<br>Jaswal     | 06/14/2024 /<br>Jaswal         | M5985             |
| Supplier                    | ItemCode / ItemName                                            | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | WW-LFS-1 / Laboratory<br>Fortified Stock Solution 1,<br>125 ml | T2-MEB723367 | 08/30/2026         | 08/13/2024 /<br>Jaswal     | 05/14/2024 /<br>Jaswal         | M6000             |
| Supplier                    | ItemCode / ItemName                                            | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | WW-LFS-2 / Laboratory<br>Fortified Stock Solution 2,<br>125 ml | U2-MEB731108 | 03/17/2028         | 08/13/2024 /<br>Jaswal     | 05/14/2024 /<br>Jaswal         | M6009             |
| Supplier                    | ItemCode / ItemName                                            | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57023 / V, 1000 PPM, 125<br>ml                                 | 062424       | 06/24/2027         | 09/28/2024 /<br>jaswal     | 08/05/2024 /<br>Jaswal         | M6021             |
| Supplier                    | ItemCode / ItemName                                            | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57081 / TI, 1000 PPM, 125<br>ml                                | 0624724      | 06/27/2027         | 08/05/2024 /<br>kareem     | 08/05/2024 /<br>Jaswal         | M6023             |
| Supplier                    | ItemCode / ItemName                                            | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57048 / Cd, 1000 PPM,<br>125 ml                                | 070124       | 07/01/2027         | 08/05/2024 /<br>kareem     | 01/25/2019 /<br>Jaswal         | M6028             |
|                             |                                                                |              |                    |                            |                                |                   |



| Supplier                    | ItemCode / ItemName                                               | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|-------------------------------------------------------------------|------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57047 / Ag, 1000 PPM,<br>125 ml                                   | 122823     | 12/28/2026         | 08/05/2024 /<br>kareem     | 08/05/2024 /<br>Jaswal         | M6030             |
| Supplier                    | ItemCode / ItemName                                               | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58113 / Al, 10000 PPM,<br>500 ml                                  | 011623     | 01/16/2026         | 08/07/2024 /<br>Jaswal     | 01/03/2024 /<br>Jaswal         | M6033             |
| Supplier                    | ItemCode / ItemName                                               | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-9530-33 / Hydrochloric<br>Acid, Instra-Analyzed<br>(cs/6x2.5L) |            | 03/17/2029         | 10/26/2024 /<br>Janvi      | 10/21/2024 /<br>Janvi          | M6095             |
| Supplier                    | ItemCode / ItemName                                               | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-9530-33 / Hydrochloric<br>Acid, Instra-Analyzed<br>(cs/6x2.5L) | 22F0762009 | 05/09/2027         | 11/04/2024 /<br>Eman       | 09/29/2024 /<br>Janvi          | M6111             |
| Supplier                    | ItemCode / ItemName                                               | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-9598-34 / Nitric Acid,<br>Instra-Analyzed (cs/4x2.5L)          | 24B1362001 | 04/29/2025         | 10/31/2024 /<br>Janvi      | 09/29/2024 /<br>Eman           | M6113             |
| Supplier                    | ItemCode / ItemName                                               | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-9598-34 / Nitric Acid,                                         | 24B1362001 | 05/06/2025         | 11/06/2024 /               | 09/29/2024 /                   | M6117             |



| Supplier         | ItemCode / ItemName | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|------------------|---------------------|---------------------|--------------------|----------------------------|--------------------------------|-------------------|
| Seidler Chemical | DIW / DI Water      | Daily Lab-Certified | 10/24/2024         | 10/24/2019 /<br>apatel     | 10/24/2019 /<br>apatel         | W2606             |
|                  |                     | ii                  |                    | -                          |                                |                   |
| Supplier         | ItemCode / ItemName | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |

| m/z-> | 1.067 | m/z-><br>2.0€7 | 5.014 | m/z-><br>1.0E5 | 2.5E4 | 5.<br>0<br>114                        | 1. Cadmium nitrate tetrahydrate (Cd) | Compound                                                                           | Weight shov                                          | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): |                                               | CERTIFIED WEIGHT REPORT: | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|-------|-------|----------------|-------|----------------|-------|---------------------------------------|--------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|--------------------------|------------------------------------------------------------------------------------------|
|       |       | <br><br>0      |       | 0 <sup>6</sup> |       | [1] Spectrum No.1                     |                                      | RM#                                                                                | Weight shown below was dliuted to (mL):              | Expiration Date:<br>nended Storage:<br>ntration (µg/mL):                   | Part Number:<br>Lot Number:<br>Description:   | PORT:                    | <b>15, Inc.</b><br>om                                                                    |
|       |       | 120            |       | 20             |       | -                                     | IN024 CDM092021A1                    | Lot<br>Number                                                                      | 6UTB<br>uted to (mL):                                | 070127<br>Ambient (20 °C)<br><b>1000</b>                                   | <u>57048</u><br><u>070124</u><br>Cadmium (Cd) |                          |                                                                                          |
|       |       | 130            |       | 30             |       | 12.514 800                            | 1000 99.                             | Nominal Pu<br>Conc. (µg/mL) (1                                                     | 2000.07 0.1                                          |                                                                            | (Cd)                                          |                          | R                                                                                        |
| 200   |       | 140            |       | \$             |       | 12.514 sec]:58148.D# [Count] [Linear] | 99.999 0.10 36.5                     | Purity Uncertainty Assay<br>(%) Purity (%) (%)                                     | 5E-05 Balance Uncertainty<br>0.100 Flask Uncertainty |                                                                            | Solvent:<br>2%                                |                          | Certified R                                                                              |
|       |       | 1<br>()<br>()  |       | ő              |       | Count] [Line                          | .5 5.4797                            | say Target<br>6) Weight (g)                                                        | ţy                                                   |                                                                            | ent: 24002546<br>2% 40.0                      | Lot #                    | Certified Reference Material CRM<br>S 15 12 4                                            |
|       |       | 160            |       | 0<br>O         |       | ar]                                   | 5.4804                               | Actual Actual<br>Weight (g) Conc. (µg/mL)                                          |                                                      |                                                                            | Nitric Acid                                   |                          | terial CRM                                                                               |
|       |       | 170            |       | 70             |       |                                       | 1000.1                               | 11                                                                                 | Re                                                   | 53<br>80                                                                   | 5                                             |                          | M6028                                                                                    |
|       |       | -1 2<br>C      |       | BO             |       |                                       | 10022-68-1                           | Expanded<br>Uncertainty (Solvent<br>+/- (µg/mL) CAS# 0                             | Reviewed By: Ped                                     | \$                                                                         | Alloch & B                                    |                          | -                                                                                        |
|       |       | 190 200        |       | 90 100         |       |                                       |                                      | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD51 | Pedro L. Rentas                                      | ento                                                                       | Brack                                         |                          | ANAB IS<br>AR-153<br>https://Ab                                                          |
|       |       |                |       | -              |       |                                       | orl-rat 60.2mg/kg 3108               | ned pg.) NIST<br>LD50 SRM                                                          | 070124                                               |                                                                            | 070194                                        |                          | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

1 of 2

Part # 57048

Lot # 070124

Printed: 8/1/2024, 2:13:25 PM





https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

# Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|                      | F        | ₽        | B     | DC    |          | Ŗ     | AS            |       | Sb    | A            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -       |          |
|----------------------|----------|----------|-------|-------|----------|-------|---------------|-------|-------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|
|                      | 10.04    | 200      | <0.02 | <0.01 |          | 3     | 202           |       | 40.02 | <0.02        | 200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |          |
|                      | <u>_</u> | 2        | ଚ     | 5     | <u>ې</u> | ç     | ŝ             |       | ç     | ğ            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |          |
|                      | 70.02    | 3        | 40.02 | <0.02 | 10.02    | 33    | 20.02         |       | 3     | Т            | ALC: NOT THE REAL OF THE REAL |         |          |
|                      | - AU     |          | Ş     | Ga    | n g      | 5     | Ē             | 1     | Ę     | Dy           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |          |
|                      | 20.02    |          | 3     | <0.02 | SU.UZ    | 3     | <0.02         | 10.02 | 3     | <b>40.02</b> | and the second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |          |
|                      | 1-3      | 2        | 2     | 2     | -        | r!    | b             | 110   | Ş     | Hf           | Constant of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         | _        |
|                      | 20.02    | 20.02    | 55    | <0.2  | 20.02    | 3     | A).02         | 20.02 | 3     | 40.02        | And a subscription                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Ŀ       | N OUK    |
|                      | Nd       | UTAT     | Ş     | Hg    | MIN      |       | Mg            | Ę     |       | E            | C. NTALITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         | Aptalo   |
| (T) = Target analyte | 20.02    | 20.02    | 200   | 40 i2 | <0.02    | 2     | <b>40</b> .01 | 70.05 | 5     | <0.02        | ALC: NO ALC: NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         | Varifics |
| yet anal             | ×        | 2        | 2     | ٣     | Pd       | !     | õ             | NO    | f.    | N            | The state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         | tion     |
| vte                  | 40 2     | 20.02    | 5     | <0.02 | <0.02    |       | <0.02         | <0.02 |       | <0.02        | 一般的なもの                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |          |
|                      | sc       | ND<br>ND | 2     | Ru    | Rb       |       | Rh            | Ke    | 1     | Ŗ            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         | NC L     |
|                      | 40.02    | 20.02    |       | <0.02 | <0.02    |       | A0 03         | <0.02 |       | 40.02        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | agrint) |          |
|                      | Ta       | s.       | , ;   | ş     | Na       | 9     | Ao            | S     |       | Se           | SOME NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |          |
|                      | <0.02    | <0.02    |       | 20.03 | <0.2     | 10.01 | 88            | <0.02 |       | c (1>        | <b>ENVERTOR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |          |
|                      | H        | Sa       |       | j     | ľ        |       | 3             | Te    |       | 77           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |          |
|                      | <0.02    | <0.02    | 10.0# | -0 N3 | <0.02    | 10.02 | 3             | <0.02 | 10.01 | SUP          | The state was a state of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |          |
|                      | 27       | 2        | *     | <     | 4        | ~     | <             | d     |       | W            | N-SNEW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |          |
|                      | <0.02    | <0.02    | 70.02 | 3     | <0.02    | 20.02 | 3             | 40.02 | 20:01 |              | Providential of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |          |

# Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

In P. S.

Certified by:

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

- \* All standard containers are meticulously cleaned prior to use.
- \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST

Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

**e**24

M5296 OP: 09/19/2022 BH



# **Certificate of Analysis**

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



### 2.0 **PRODUCT DESCRIPTION**

| Product Code:       | Multi Analyte Custom Grade Solution               | n                   |
|---------------------|---------------------------------------------------|---------------------|
| Catalog Number:     | CHEM-CLP-4                                        |                     |
| Lot Number:         | S2-MEB711673                                      |                     |
| Matrix:             | 3% (v/v) HNO3<br>3% (v/v) HF                      |                     |
| Value / Analyte(s): | 1 000 μg/mL ea:<br>Boron,<br>Silicon,<br>Titanium | Molybdenum,<br>Tin, |

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE<br>Boron, B | CERTIFIED VALUE<br>1 000 ± 6 μg/mL | ANALYTE<br>Molybdenum, Mo | CERTIFIED VALUE<br>1 000 ± 6 μg/mL |          |
|---------------------|------------------------------------|---------------------------|------------------------------------|----------|
| Silicon, Si         | 1 000 ± 7 μg/mL                    | Tin, Sn                   | 1 000 ± 6 µg/mL                    |          |
| Titanium, Ti        | 1 000 ± 7 μg/mL                    |                           |                                    |          |
| Density:            | 1.030 g/mL (meas                   | sured at 20 ± 4 °C)       |                                    |          |
| Assay Information   | n:                                 |                           |                                    |          |
| ANALYTE             | METHOD                             | NIST SRM#                 |                                    | SRM LOT# |
| B                   | ICP Assav                          | 3107                      |                                    | 110830   |

| В  | ICP Assay | 3107  | 110830 |
|----|-----------|-------|--------|
| Мо | ICP Assay | 3134  | 130418 |
| Si | ICP Assay | 3150  | 130912 |
| Sn | ICP Assay | 3161a | 140917 |
| Ti | ICP Assay | 3162a | 130925 |
|    |           |       |        |

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| Characterization of CRM/RM by Two or More Methods<br>Certified Value, X <sub>CRM/RM</sub> , where two or more methods of characterization are                                                            | Characterization of CRM/RM by One Method<br>Certified Value, X <sub>CRM/RM</sub> , where one method of characterization                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| used is the weighted mean of the results:                                                                                                                                                                | is used is the mean of individual results:                                                                                                                  |
| $X_{CRM/RM} = \Sigma(w_i) (X_i)$                                                                                                                                                                         | X <sub>CRM/RM</sub> = (X <sub>a</sub> ) (u <sub>char a</sub> )                                                                                              |
| X <sub>i</sub> = mean of Assay Method i with standard uncertainty u <sub>char i</sub>                                                                                                                    | X <sub>a</sub> = mean of Assay Method A with                                                                                                                |
| $w_i$ = the weighting factors for each method calculated using the inverse square of the variance:<br>$w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$                                                 | u <sub>char</sub> a = the standard uncertainty of characterization Method A                                                                                 |
| CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>lts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>1/2</sup> | CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> char a + u <sup>2</sup> bb + u <sup>2</sup> lts + u <sup>2</sup> ts) <sup>1</sup> |
| k = coverage factor = 2                                                                                                                                                                                  | k = coverage factor = 2                                                                                                                                     |
| $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method                                | u <sub>char a</sub> = the errors from characterization                                                                                                      |
| ubb = bottle to bottle homogeneity standard uncertainty                                                                                                                                                  | u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty                                                                                         |
| u <sub>lts</sub> = long term stability standard uncertainty (storage)                                                                                                                                    | ults = long term stability standard uncertainty (storage)                                                                                                   |
| u <sub>te</sub> = transport stability standard uncertainty                                                                                                                                               | ute = transport stability standard uncertainty                                                                                                              |

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

### 4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

### 4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

### 6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ} - 24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

HF Note: This standard should not be prepared or stored in glass.

### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

### 9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

### 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### **11.1 Certification Issue Date**

November 02, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

### 11.2 Lot Expiration Date

### - November 02, 2026

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

### Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



# **Certificate of Analysis**

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

3.0

P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



### 2.0 PRODUCT DESCRIPTION

| Product Code:       | Multi Analyte Custom Grade So                   | lution                |
|---------------------|-------------------------------------------------|-----------------------|
| Catalog Number:     | CLPP-CAL-1                                      |                       |
| Lot Number:         | T2-MEB714417                                    |                       |
| Matrix:             | 5% (v/v) HNO3                                   |                       |
| Value / Analyte(s): | 5 000 μg/mL ea:<br>Calcium,<br>Magnesium,       | Potassium,<br>Sodium, |
|                     | 2 000 μg/mL ea:<br>Aluminum,                    | Barium,               |
|                     | 1 000 μg/mL ea:<br>Iron,                        |                       |
|                     | 500 μg/mL ea:<br>Nickel,<br>Zinc,<br>Manganese, | Vanadium,<br>Cobalt,  |
|                     | 250 μg/mL ea:<br>Silver,                        | Copper,               |
|                     | 200 μg/mL ea:<br>Chromium,                      |                       |
|                     | 50 μg/mL ea:<br>Beryllium                       |                       |
| CERTIFIED VALUE     | S AND UNCERTAINTIES                             |                       |

| ANALYTE<br>Aluminum, Al | CERTIFIED VALUE<br>2 000 ± 7 μg/mL | ANALYTE<br>Barium, Ba | CERTIFIED VALUE<br>2 000 ± 9 μg/mL |
|-------------------------|------------------------------------|-----------------------|------------------------------------|
| Beryllium, Be           | 50.00 ± 0.26 μg/mL                 | Calcium, Ca           | 5 000 ± 22 μg/mL                   |
| Chromium, Cr            | 200.0 ± 1.0 μg/mL                  | Cobalt, Co            | 500.0 ± 2.4 μg/mL                  |
| Copper, Cu              | 250.0 ± 1.0 μg/mL                  | Iron, Fe              | 1 000 ± 4 μg/mL                    |
| Magnesium, Mg           | 5 000 ± 20 μg/mL                   | Manganese, Mn         | 500.0 ± 2.0 μg/mL                  |
| Nickel, Ni              | 500.0 ± 2.2 μg/mL                  | Potassium, K          | 5 000 ± 19 μg/mL                   |
| Silver, Ag              | 250.0 ± 1.1 μg/mL                  | Sodium, Na            | 5 000 ± 18 μg/mL                   |
| Vanadium, V             | 499.7 ± 2.2 μg/mL                  | Zinc, Zn              | 500.0 ± 2.2 μg/mL                  |

Density:

1.118 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

| ANALYTE<br>Ag | METHOD<br>ICP Assay | NIST SRM#<br>3151 | SRM LOT#<br>160729 |
|---------------|---------------------|-------------------|--------------------|
| Ag            | Volhard             | 999c              | 999c               |
| AI            | ICP Assay           | 3101a             | 140903             |
| AI            | EDTA                | 928               | 928                |
| Ва            | ICP Assay           | 3104a             | 140909             |
| Ва            | Gravimetric         |                   | See Sec. 4.2       |
| Ве            | ICP Assay           | 3105a             | 090514             |
| Ве            | Calculated          |                   | See Sec. 4.2       |
| Са            | ICP Assay           | 3109a             | 130213             |
| Са            | EDTA                | 928               | 928                |
| Со            | ICP Assay           | 3113              | 190630             |
| Со            | EDTA                | 928               | 928                |
| Cr            | ICP Assay           | 3112a             | 170630             |
| Cr            | Calculated          |                   | See Sec. 4.2       |
| Cu            | ICP Assay           | 3114              | 121207             |
| Cu            | EDTA                | 928               | 928                |
| Fe            | ICP Assay           | 3126a             | 140812             |
| Fe            | EDTA                | 928               | 928                |
| К             | ICP Assay           | 3141a             | 140813             |
| К             | Gravimetric         |                   | See Sec. 4.2       |
| Mg            | ICP Assay           | 3131a             | 140110             |
| Mg            | EDTA                | 928               | 928                |
| Mn            | ICP Assay           | 3132              | 050429             |
| Mn            | EDTA                | 928               | 928                |
| Na            | ICP Assay           | 3152a             | 120715             |
| Na            | Gravimetric         |                   | See Sec. 4.2       |
| Ni            | ICP Assay           | 3136              | 120619             |
| Ni            | EDTA                | 928               | 928                |
| V             | IC Assay            | 3165              | 160906             |
| V             | EDTA                | 928               | 928                |
| Zn            | ICP Assay           | 3168a             | 120629             |
| Zn            | EDTA                | 928               | 928                |
|               |                     |                   |                    |

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| Characterization of CRM/RM by Two or More Methods<br>Certified Value, X <sub>CRM/RM</sub> , where two or more methods of characterization are                                                            | Characterization of CRM/RM by One Method<br>Certified Value, X <sub>CRM/RM</sub> , where one method of characterization                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| used is the weighted mean of the results:                                                                                                                                                                | is used is the mean of individual results:                                                                                                                  |
| $X_{CRM/RM} = \Sigma(w_i) (X_i)$                                                                                                                                                                         | X <sub>CRM/RM</sub> = (X <sub>a</sub> ) (u <sub>char a</sub> )                                                                                              |
| X <sub>i</sub> = mean of Assay Method i with standard uncertainty u <sub>char i</sub>                                                                                                                    | X <sub>a</sub> = mean of Assay Method A with                                                                                                                |
| $w_i$ = the weighting factors for each method calculated using the inverse square of the variance:<br>$w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$                                                 | u <sub>char</sub> a = the standard uncertainty of characterization Method A                                                                                 |
| CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>lts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>1/2</sup> | CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> char a + u <sup>2</sup> bb + u <sup>2</sup> lts + u <sup>2</sup> ts) <sup>1</sup> |
| k = coverage factor = 2                                                                                                                                                                                  | k = coverage factor = 2                                                                                                                                     |
| $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method                                | u <sub>char a</sub> = the errors from characterization                                                                                                      |
| ubb = bottle to bottle homogeneity standard uncertainty                                                                                                                                                  | u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty                                                                                         |
| u <sub>lts</sub> = long term stability standard uncertainty (storage)                                                                                                                                    | ults = long term stability standard uncertainty (storage)                                                                                                   |
| u <sub>te</sub> = transport stability standard uncertainty                                                                                                                                               | ute = transport stability standard uncertainty                                                                                                              |

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

### 4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

### 4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

### 6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20°  $\pm$  4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Note: This solution contains Silver (Ag), please refer to our Sample Preparation Guide for more information.

https://www.inorganicventures.com/sample-preparation-guide/samples-containing-silver

### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

### 9.0 HOMOGENEITY

 This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

### 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### 11.1 Certification Issue Date

January 27, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

### 11.2 Lot Expiration Date

### - January 27, 2027

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines



**Certificate of Analysis** 

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



### 2.0 **PRODUCT DESCRIPTION**

| Product Code:       | Multi Analyte Custom Grade Soluti        | on                 |
|---------------------|------------------------------------------|--------------------|
| Catalog Number:     | CLPP-CAL-3                               |                    |
| Lot Number:         | T2-MEB714159                             |                    |
| Matrix:             | 7% (v/v) HNO3                            |                    |
| Value / Analyte(s): | 1 000 μg/mL ea:<br>Arsenic,<br>Selenium, | Lead,<br>Thallium, |
|                     | 500 μg/mL ea:<br>Cadmium                 |                    |

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE<br>Arsenic, As | CERTIFIED VALUE<br>1 000 ± 8 µg/mL | ANALYTE<br>Cadmium, Cd | CERTIFIED VALUE<br>500.0 ± 2.1 μg/mL |
|------------------------|------------------------------------|------------------------|--------------------------------------|
| Lead, Pb               | 1 000 ± 5 μg/mL                    | Selenium, Se           | 1 000 ± 8 μg/mL                      |
| Thallium, Tl           | 1 000 ± 7 μg/mL                    |                        |                                      |

Density:

1.043 g/mL (measured at 20  $\pm$  4 °C)

### Assay Information:

| ANALYTE | METHOD    | NIST SRM# | SRM LOT# |
|---------|-----------|-----------|----------|
| As      | ICP Assay | 3103a     | 100818   |
| Cd      | ICP Assay | 3108      | 130116   |
| Cd      | EDTA      | 928       | 928      |
| Pb      | ICP Assay | 3128      | 101026   |
| Pb      | EDTA      | 928       | 928      |
| Se      | ICP Assay | 3149      | 100901   |
| ТІ      | ICP Assay | 3158      | 151215   |
|         |           |           |          |

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| Characterization of CRM/RM by Two or More Methods<br>Certified Value, X <sub>CRM/RM</sub> , where two or more methods of characterization are                                                            | Characterization of CRM/RM by One Method<br>Certified Value, X <sub>CRM/RM</sub> , where one method of characterization                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| used is the weighted mean of the results:                                                                                                                                                                | is used is the mean of individual results:                                                                                                                  |
| $X_{CRM/RM} = \Sigma(w_i) (X_i)$                                                                                                                                                                         | X <sub>CRM/RM</sub> = (X <sub>a</sub> ) (u <sub>char a</sub> )                                                                                              |
| X <sub>i</sub> = mean of Assay Method i with standard uncertainty u <sub>char i</sub>                                                                                                                    | X <sub>a</sub> = mean of Assay Method A with                                                                                                                |
| $w_i$ = the weighting factors for each method calculated using the inverse square of the variance:<br>$w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$                                                 | u <sub>char</sub> a = the standard uncertainty of characterization Method A                                                                                 |
| CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>lts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>1/2</sup> | CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> char a + u <sup>2</sup> bb + u <sup>2</sup> lts + u <sup>2</sup> ts) <sup>1</sup> |
| k = coverage factor = 2                                                                                                                                                                                  | k = coverage factor = 2                                                                                                                                     |
| $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method                                | u <sub>char a</sub> = the errors from characterization                                                                                                      |
| ubb = bottle to bottle homogeneity standard uncertainty                                                                                                                                                  | u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty                                                                                         |
| u <sub>lts</sub> = long term stability standard uncertainty (storage)                                                                                                                                    | ults = long term stability standard uncertainty (storage)                                                                                                   |
| u <sub>te</sub> = transport stability standard uncertainty                                                                                                                                               | ute = transport stability standard uncertainty                                                                                                              |

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

### 4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

### 4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

### 6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ} - 24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

### 9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

### 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### 11.1 Certification Issue Date

### January 13, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

### 11.2 Lot Expiration Date

### - January 13, 2027

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines

# Certificate of Analysis

Refine your results. Redefine your industry. RD:05/14/2024

**INORGANIC**" V E N T U R E S

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



### 2.0 PRODUCT DESCRIPTION

| Product Code:   | Multi Analyte Custom Grade Solution |
|-----------------|-------------------------------------|
| Catalog Number: | WW-LFS-1                            |
| Lot Number:     | T2-MEB723367                        |
| Matrix:         | 5% (v/v) HNO3                       |

|     | Value / Analyte(s): | 1 000 µg/mL ea:<br>Potassium,                              |                                                 |  |
|-----|---------------------|------------------------------------------------------------|-------------------------------------------------|--|
|     |                     | 600 μg/mL ea:<br>Phosphorus,                               |                                                 |  |
|     |                     | 300 µg/mL ea:<br>Sodium,                                   | Iron,                                           |  |
|     |                     | 200 µg/mŁ ea:<br>Magnesium,<br>Cerium,<br>Thallium,        | Aluminum,<br>Selenium,                          |  |
|     |                     | 100 µg/mL ea:<br>Lead,                                     | Calcium,                                        |  |
|     |                     | 80 μg/mL ea:<br>Arsenic,                                   |                                                 |  |
|     |                     | 70 μg/mL ea:<br>Mercury,                                   |                                                 |  |
|     |                     | 50 μg/mL ea:<br>Nickel,                                    |                                                 |  |
|     |                     | 40 µg/mL ea:<br>Chromium,                                  |                                                 |  |
|     |                     | 30 µg/mL ea:<br>Copper,<br>Vanadium,                       | Boron,                                          |  |
|     |                     | 20 μg/mL ea:<br>Zinc,<br>Barium,<br>Cadmium,<br>Manganese, | Strontium,<br>Beryllium,<br>Cobalt,<br>Lithium, |  |
| 3.0 | CERTIFIED VALUES    | 7.5 µg/mL ea:<br>Silver<br>AND UNCERTAINTI                 | ES                                              |  |

| ANALYTE<br>Aluminum, Al | CERTIFIED VALUE<br>200.0 ± 0.7 µg/mL | ANALYTE<br>Arsenic, As | CERTIFIED VALUE<br>80.0 ± 0.7 µg/mL |
|-------------------------|--------------------------------------|------------------------|-------------------------------------|
| Barium, Ba              | 20.00 ± 0.09 µg/mL                   | Beryllium, Be          | 20.00 ± 0.13 µg/mL                  |
| Boron, B                | 30.00 ± 0.18 µg/mL                   | Cadmium, Cd            | 20.00 ± 0.09 µg/mL                  |
| Calcium, Ca             | 100.0 ± 0.4 μg/mL                    | Cerium, Ce             | 200.0 ± 0.8 μg/mL                   |
| Chromium, Cr            | 40.00 ± 0.30 μg/mL                   | Cobalt, Co             | 20.00 ± 0.10 µg/mL                  |
| Copper, Cu              | 30.00 ± 0.13 µg/mL                   | Iron, Fe               | 300.0 ± 1.3 μg/mL                   |
| Lead, Pb                | 100.0 ± 0.4 µg/mL                    | Lithium, Li            | 20.00 ± 0.08 µg/mL                  |
| Magneslum, Mg           | 200.0 ± 0.8 µg/mL                    | Manganese, Mn          | 20.00 ± 0.08 µg/mL                  |
| Mercury, Hg             | 70.0 ± 0.3 µg/mL                     | Nickel, Ni             | 50.00 ± 0.22 μg/mL                  |
| Phosphorus, P           | 600.0 ± 2.7 μg/mL                    | Potassium, K           | 1 000 ± 4 µg/mL                     |
| Selenium, Se            | 200.0 ± 1.3 µg/mL                    | Silver, Ag             | 7.50 ± 0.03 μg/mL                   |
| Sodium, Na              | 300.0 ± 1.4 μg/mL                    | Strontium, Sr          | 20.01 ± 0.08 µg/mL                  |
| Thailium, Ti            | 200.0 ± 1.4 µg/mL                    | Vanadium, V            | 30.00 ± 0.13 μg/mL                  |
| Zinc, Zn                | 20.00 ± 0.09 µg/mL                   |                        |                                     |
|                         |                                      |                        |                                     |

Density:

1.034 g/mL (measured at 20  $\pm$  4 °C)

Assay Information:

| ANALYTE<br>Ag | METHOD<br>ICP Assay      | NIST SRM#<br>3151  | SRM LOT#<br>160729 |
|---------------|--------------------------|--------------------|--------------------|
| Ag            | Volhard                  | 999c               | 999c               |
| Ag            | Calculated               |                    | See Sec. 4.2       |
| A             | ICP Assay                | 3101a              | 140903             |
| Al            | EDTA                     | 928                | 928                |
| As            | ICP Assay                | 3103a              | 100818             |
| В             | ICP Assay                | 3107               | 190605             |
| Ba            | ICP Assay                | 3104a              | 140909             |
| Ва            | Gravimetric              |                    | See Sec. 4.2       |
| Be            | ICP Assay                | 3105a              | 090514             |
| Са            | ICP Assay                | 3109a              | 130213             |
| Ca            | EDTA                     | 928                | 928                |
| Cd            | ICP Assay                | 3108               | 130116             |
| Cd            | EDTA                     | 928                | 928                |
| Се            | ICP Assay                | 3110               | 090504             |
| Ce            | EDTA                     | 928                | 928                |
| Co            | ICP Assay                | 3113               | 190630             |
| Со            | EDTA                     | 928                | 928                |
| Cr            | ICP Assay                | 3112a              | 170630             |
| Cu            | ICP Assay                | 3114               | 121207             |
| Cu            | EDTA                     | 928                | 928                |
| Fe            | ICP Assay                | 3126a              | 140812             |
| Fe            | EDTA                     | 928                | 928                |
| Hg            | ICP Assay                | 3133               | 160921             |
| Hg            | EDTA                     | 928                | 928                |
| к             | ICP Assay                | 3141a              | 140813             |
| к             | Gravimetric              |                    | See Sec. 4.2       |
| Li            | ICP Assay                | 3129a              | 100714             |
| Li            | Gravimetric              |                    | See Sec. 4.2       |
| Mg            | ICP Assay                | 3131a              | 140110             |
| Mg            | EDTA                     | 928                | 928                |
| Mn            | ICP Assay                | 3132               | 050429             |
| Mn            | EDTA                     | 928                | 928                |
| Na            | ICP Assay                | Traceable to 3152A | S2-NA700842        |
| Na            | Gravimetric              | 0400               | See Sec. 4.2       |
| Ni<br>Ni      | ICP Assay                | 3136               | 120619             |
| P             | EDTA                     | 928<br>3139a       | 928                |
| P             | ICP Assay<br>Acidimetric |                    | 060717             |
| F<br>Pb       | ICP Assay                | 84L<br>3128        | 84L                |
| Pb            | EDTA                     | 928                | 101026<br>928      |
| Se            | ICP Assay                | 3149               | 920<br>100901      |
| Sr            | EDTA                     | 928                | 928                |
| Sr            | ICP Assay                | Traceable to 3153a | 920<br>K2-SR650985 |
| TI            | ICP Assay                | 3158               | 151215             |
| V             | IC Assay                 | 3165               | 160906             |
| v             | EDTA                     | 928                | 928                |
| Zn            | ICP Assay                | 3168a              | 120629             |
| Zn            | EDTA                     | 928                | 928                |
|               | Eco 4                    |                    |                    |

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The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| Characterization of CRM/RM by Two or More Methods                                                                                                                                                                                                                                                                                                                                                                                                       | Characterization of CRM/RM by One Method                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Certified Value, X <sub>CRMRM</sub> , where two or more methods of characterization are<br>used is the weighted mean of the results:                                                                                                                                                                                                                                                                                                                    | Certified Value, X <sub>CRM/RM</sub> , where one method of characterization<br>is used is the mean of individual results:                                                                                                                                                                                                                                                                                                       |
| $\begin{split} & X_{CRM/RM} \equiv \Sigma(w_i) \; (X_i) \\ & X_i = \text{mean of Assay Method i with standard uncertainty u_{char, i} \\ & w_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & w_i = (1/u_{char, i})^2 / (\Sigma(1/(u_{char, i})^2)) \end{split}$                                                                                                                              | $X_{CRM/RM} = (X_a) (u_{char a})$<br>$X_a = mean of Assay Method A withu_{char a} = the standard uncertainty of characterization Method A$                                                                                                                                                                                                                                                                                      |
| CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k $(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{V_2}$<br>k = coverage factor = 2<br>$u_{char} = [\Sigma[(w_i)^2 (u_{char}_i)^2])^{V_2}$ where $u_{char}$ is the errors from each characterization method<br>$u_{bb}$ = bottle to bottle homogeneity standard uncertainty<br>$u_{lts} = long term stability standard uncertainty (storage) u_{te} = transport stability standard uncertainty$ | CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k ( $u^2_{chara} + u^2_{bb} + u^2_{tts} + u^2_{ts}$ ) <sup>1/k</sup><br>k = coverage factor = 2<br>u <sub>chara</sub> = the errors from characterization<br>u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty<br>u <sub>Its</sub> = long term stability standard uncertainty (storage)<br>u <sub>uts</sub> = transport stability standard uncertainty |

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

### 4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

### 4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

## 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

### 6.0 INTENDED USE

4.0

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$  -  $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Low Silver Note: This solution contains "LOW" levels of Silver. Please store this entire bottle inside a sealed glass jar.

### 8.0 **HAZARDOUS INFORMATION**

Please refer to the Safety Data Sheet for information regarding this CRM/RM.

### 9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

### 10.0 **QUALITY STANDARD DOCUMENTATION**

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### **11.1 Certification Issue Date**

August 30, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

### 11.2 Lot Expiration Date

### - August 30, 2026

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### **11.3 Period of Validity**

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

SD9781.

Certifying Officer:

**Paul Gaines** Chairman / Senior Technical Director

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# **Certificate of Analysis**

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300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

INORGANI

VENTURES

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



### 2.0 PRODUCT DESCRIPTION

| Product Code:       | Multi Analyte Custom Grade Solution |
|---------------------|-------------------------------------|
| Catalog Number:     | WW-LFS-2                            |
| Lot Number:         | U2-MEB731108                        |
| Matrix:             | 5% (v/v) HNO3<br>tr. HF             |
| Value / Analyte(s): | 200 μg/mL ea:<br>Silica,            |
|                     | 80 μg/mL ea:<br>Antimony,           |
|                     | 70 μg/mL ea:<br>Tin,                |
|                     | 40 μg/mL ea:<br>Molybdenum,         |
|                     | 20 μg/mL ea:                        |
|                     | Titanium                            |
|                     |                                     |

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE<br>Antimony, Sb | CERTIFIED VALUE<br>80.1 ± 0.6 µg/mL | ANALYTE<br>Molybdenum, Mo | CERTIFIED VALUE<br>40.03 ± 0.18 µg/mL |
|-------------------------|-------------------------------------|---------------------------|---------------------------------------|
| Silica, SIO2            | 200.2 ± 1.3 μg/mL                   | Tin, Sn                   | 70.0 ± 0.4 µg/mL                      |
| Titanium, Ti            | 20.01 ± 0.13 μg/mL                  |                           |                                       |

Density:

1.025 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

| ANALYTE<br>Mo | METHOD<br>ICP Assay | NIST SRM#<br>3134 | SRM LOT#<br>130418 |
|---------------|---------------------|-------------------|--------------------|
| Мо            | Calculated          |                   | See Sec. 4.2       |
| Sb            | ICP Assay           | 3102a             | 140911             |
| SiO2          | ICP Assay           | 3150              | 130912             |
| Sn            | ICP Assay           | 3161a             | 140917             |
| π             | ICP Assay           | 3162a             | 130925             |
| Ті            | Calculated          |                   | See Sec. 4.2       |
|               |                     |                   |                    |

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

### Characterization of CRM/RM by Two or More Methods

Certified Value, X<sub>CRWRM</sub>, where two or more methods of characterization are used is the weighted mean of the results:

 $X_{CRM/RM} = \Sigma(w_i) (X_i)$ 

 $X_i$  = mean of Assay Method i with standard uncertainty u<sub>char</sub> i w<sub>i</sub> = the weighting factors for each method calculated using the inverse square of the variance:

 $w_i = (1/u_{char_i})^2 / (\Sigma(1/(u_{char_i})^2))$ 

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} \simeq k \left\{ u_{char}^2 + u_{bb}^2 + u_{ts}^2 + u_{ts}^2 \right\}^{\frac{1}{2}}$ 

k = coverage factor = 2

 $\begin{array}{l} u_{char} = [\overline{\Sigma}((w_{i})^{2} \, (u_{char})^{2})]^{2} \ \ \, \mbox{ where } u_{char} \ \, _{i} \mbox{ are the errors from each characterization method} \\ u_{bb} = bottle \ \, \mbox{ bottle homogeneity standard uncertainty} \\ u_{hs} = long \ \, \mbox{ term stability standard uncertainty (storage)} \end{array}$ 

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mean of individual results:

$$\begin{split} X_{CRM/RM} = (X_{a}) (u_{oher \ a}) \\ X_{a} = mean \ of Assay Method A with \\ u_{oher \ a} = the standard uncertainty of characterization Method A \end{split}$$

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{its}^2 + u_{ts}^2)^{\frac{1}{2}}$ 

 $\label{eq:coverage factor = 2} \\ u_{char} a = the errors from characterization \\ u_{bb} = bottle to bottle homogeneity standard uncertainty$  $u_{its} = long term stability standard uncertainty (storage)$  $u_{its} = transport stability standard uncertainty$ 

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

### 4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

### 4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

### 6.0 INTENDED USE

**6.1** This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale</u>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$  -  $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT HF Note: This standard should not be prepared or stored in glass.

### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

### 9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

### 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### **11.1 Certification Issue Date**

March 17, 2023

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

### 11.2 Lot Expiration Date

### - March 17, 2028

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

### NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

3D978 .........

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

Instructions for QATS Reference Material: ICP-AES ICS

### QATS LABORATORY INORGANIC REFERENCE MATERIAL INTERFERENCE CHECK SAMPLE SET FOR ICP-AES (ICSA WITH ICSB)

**NOTE:** These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

- **APPLICATION:** For use with the CLP SFAM01.0 SOW and revisions.
  - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".

<u>CAUTION:</u> The bottle(s) should be protected from light during storage to ensure the stability of silver which is contained in the ICSB solution. The bottle(s) should be stored at room temperature. **Do not allow the solution(s) to freeze.** 

### (B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY APTIM Federal Services, LLC 2700 Chandler Avenue - Building C Las Vegas, NV 89120

### (C) ANALYSIS OF SAMPLES

The interference check sample set is to be used to verify inter-element and background correction factors of inductively-coupled plasma (ICP) spectrometers. This reference material set consists of two (2) concentrated solutions. The ICSA solution contains the four (4) interferent elements: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

RM ICP-AES ICSA-1211 B-0710 SFAM.docx

Page 1 of 2

QATS Form 20-007F189R01, 01-17-2023



The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.



**ICSA** 

M5126

M5127

M5128

M5129

M5130

### Instructions for QATS Reference Material: ICP-AES ICS

Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for ICP-AES Part A and Part B target analytes when diluted as directed.

Using Class "A" glassware, preparation and analysis must be performed according to the following instructions:

**ICSA-1211, Interferents:** Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSA solution by ICP-AES.

**ICSB-0710, Analytes, mixed with ICSA-1211, Interferents:** Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-AES.

### (D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-AES ICS SOLUTION(S)

The "Certified Value" concentrations of the elements, listed in Table 1 below, were derived from statistically pooled analysis results from the following sources, if available: QATS Laboratory, CLP laboratories, Quarterly Blind (QB)/Proficiency Testing (PT) events, CLP pre-award events, and external referee laboratories.

| Table 1. | "CERTIFIE |                  |                        | ERENCE CH               | IECK SAMPL<br>CSB-0710      | E ICP-AES IO           | CSA-1211,               |
|----------|-----------|------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
| Element  | CRQL      | Part A<br>(µg/L) | Low<br>Limit<br>(µg/L) | High<br>Limit<br>(µg/L) | Part A<br>+Part B<br>(µg/L) | Low<br>Limit<br>(µg/L) | High<br>Limit<br>(µg/L) |
| AI       | 200       | 255000           | 216000                 | 294000                  | 247000                      | 209000                 | 285000                  |
| Sb       | 60        | (0.0)            | -60.0                  | 60.0                    | 618                         | 525                    | 711                     |
| As       | 10        | (0.0)            | -10.0                  | 10.0                    | 104                         | 88.4                   | 120                     |
| Ва       | 200       | (6.0)            | -194                   | 206                     | (537)                       | 337                    | 737                     |
| Be       | 5.0       | (0.0)            | -5.0                   | 5.0                     | 495                         | 420                    | 570                     |
| Cd       | 5.0       | (1.0)            | -4.0                   | 6.0                     | 972                         | 826                    | 1120                    |
| Са       | 5000      | 245000           | 208000                 | 282000                  | 235000                      | 199000                 | 271000                  |
| Cr       | 10        | (52.0)           | 42.0                   | 62.0                    | 542                         | 460                    | 624                     |
| Со       | 50        | (0.0)            | -50.0                  | 50.0                    | 476                         | 404                    | 548                     |
| Cu       | 25        | (2.0)            | -23.0                  | 27.0                    | 511                         | 434                    | 588                     |
| Fe       | 100       | 101000           | 85600                  | 116500                  | 99300                       | 84400                  | 114500                  |
| Pb       | 10        | (0.0)            | -10.0                  | 10.0                    | (49.0)                      | 39.0                   | 59.0                    |
| Mg       | 5000      | 255000           | 216000                 | 294000                  | 248000                      | 210000                 | 286000                  |
| Mn       | 15        | (7.0)            | -8.0                   | 22.0                    | 507                         | 430                    | 584                     |
| Ni       | 40        | (2.0)            | -38.0                  | 42.0                    | 954                         | 810                    | 1100                    |
| Se       | 35        | (0.0)            | -35.0                  | 35.0                    | (46.0)                      | 11.0                   | 81.0                    |
| Ag       | 10        | (0.0)            | -10.0                  | 10.0                    | 201                         | 170                    | 232                     |
| TI       | 25        | (0.0)            | -25.0                  | 25.0                    | (108)                       | 83.0                   | 133                     |
| V        | 50        | (0.0)            | -50.0                  | 50.0                    | 491                         | 417                    | 565                     |
| Zn       | 60        | (0.0)            | -60.0                  | 60.0                    | 952                         | 809                    | 1095                    |

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value  $\pm$  1 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value  $\pm$  15 percent of the listed certified value.

| m/z-> | 1.0E6 | 2.0E6 | m/z-> | 1000 | 2000    | 1.0E5 | 2.0E5                                | 1. Ammonium molybdate (Mo) | Compound                                                                           | Volume show                             | NIST Tes                 | Recommended Storage:<br>Nominal Concentration (µg/mL): | Expire             | Part<br>Lot<br>Des                               | CERTIFIED WEIGHT REPORT: | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|-------|-------|-------|-------|------|---------|-------|--------------------------------------|----------------------------|------------------------------------------------------------------------------------|-----------------------------------------|--------------------------|--------------------------------------------------------|--------------------|--------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------|
| 210   |       |       | 110   |      | đ       |       | [1] Spectrum No.1                    |                            | Nur                                                                                | vn below was o                          | <b>NIST Test Number:</b> | d Storage:<br>n (µg/mL):                               | Expiration Date:   | Part Number:<br>Lot Number:<br>Description:      |                          | s, Inc.                                                                                  |
| 2     |       |       | 120   |      | N       |       | No.1                                 | 58142 022222               | Part Lot<br>Number Number                                                          | Volume shown below was diluted to (mL): | <b>6UTB</b>              | Ambient (20 °C)<br>1000                                | 051725             | 57042<br>051722<br>Molybde                       |                          | -                                                                                        |
|       |       |       |       |      |         |       | [ 8.594                              | 0.1000                     | Dilution<br>Factor                                                                 | 3000.41                                 |                          | 20 °C)                                                 |                    | <u>57042</u><br><u>051722</u><br>Molybdenum (Mo) |                          |                                                                                          |
|       |       |       | 130   |      | G       |       | sec]:5704                            | 300.0                      | Initial Un<br>Vol. (mL) Pip                                                        | 0.058 Flas                              | 5E-05 Bala               |                                                        |                    |                                                  |                          | M.S.                                                                                     |
|       |       |       | 140   |      | 40<br>0 |       | 8.594 sec]:57042.D# [Count] [Linear] | 0.084                      | Uncertainty N<br>Pipette (mL) Conc                                                 | Flask Uncertainty                       | Balance Uncertainty      |                                                        |                    | MKE                                              | _                        | Certified Rep<br>M.5192                                                                  |
|       |       |       | 150   |      | 50      |       | unt] [Líne                           | 1000                       | Nominal<br>Conc. (µg/mL) Co                                                        |                                         |                          |                                                        | 0.5%               | MKBQ8597V Am                                     | Lot #                    | ference M.                                                                               |
|       |       |       | 160   |      | 60      |       | )ar]                                 | 10001.0                    | Initial<br>Conc. (µg/mL) C                                                         |                                         |                          |                                                        | 15.0 ×             | Ammonium hydroxide                               |                          | Certified Reference Material CRM<br>いちいのえいたいのんりはてい                                       |
|       |       |       | 170   |      | 70      |       |                                      | 1000.0                     | Final<br>Conc. (µg/mL)                                                             | Г                                       |                          |                                                        | Ammonium hydroxide | æ                                                | -                        | M<br>172                                                                                 |
|       |       |       |       |      |         |       |                                      | 2.1                        | Expanded<br>Uncertainty<br>+/- (µg/mL)                                             |                                         | Reviewed By:             | N's                                                    | Formulated By:     | A                                                |                          |                                                                                          |
|       |       |       | 180   |      | 80      |       |                                      | 13106-76-8                 | (Solve<br>CAS#                                                                     |                                         |                          | to I                                                   |                    | deronce                                          |                          | •                                                                                        |
|       |       |       | 190   |      | 90      |       |                                      | 5 mg(Mo)/m3                | SDS Information<br>nt Safety Info. On Attac<br>OSHA PEL (TWA)                      |                                         | Pedro L. Rentas          | era                                                    | Lawrence Barry     | An                                               |                          | nt 、                                                                                     |
|       |       |       | 200   |      | 100     |       |                                      | 13 orl-rat 333 mg/kg       | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD50 |                                         | s 051722                 | /                                                      | rry 051722         | Ψ                                                |                          | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|       |       |       |       |      |         |       |                                      | kg 3134                    | NIST                                                                               |                                         | 722                      |                                                        | 722                |                                                  |                          | 4 Accredite<br>ate Numbe<br>ndards.com                                                   |

Part # 57042 Lot # 051722

1 of 2

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| vww.absc                  | 100-368-1  |
|---------------------------|------------|
| vww.absolutestandards.com | 0-368-1131 |
| com                       | rds, I     |
|                           | Inc        |



**Certified Reference Material CRM** 



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

## Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

|          |       |          |       |     |       |     | Trace M | letals | Verifica | ition | by ICP-N | IS (µ | g/mL) |    |       |    |       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-------|----------|-------|-----|-------|-----|---------|--------|----------|-------|----------|-------|-------|----|-------|----|-------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A        | <0.02 | ß        | 40.02 | Dv  | 20.02 | Ηŕ  | 3       | 1      | -        | 1     |          |       |       |    |       |    |       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SP<br>SP | A).02 | Ĵ,       | 2.5   | 7 5 | 10.02 | 1   | <0.02   | ' E    | 20.02    | N     | <0.02    | P     | <0.02 | Se | <0.2  | 4L | <0.02 | W   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <u>,</u> |       | <u>م</u> | 10.2  | 5   | 20.02 | Ho  | <0.02   | Lu     | <0.02    | ß     | <0.02    | Re    | <0.02 | Si | 40.02 | 5  | <0.02 | 11  | 4000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2        | 202   | ŝ        | 20.02 | E   | <0.02 | h   | <0.02   | Mg     | <0.01    | ò     | <007     | Rh    | 50    | ۸, | 2003  | 3  | 3     | : ( |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Ba       | 40.02 | S        | <0.02 | 2   | 300   | 7   | 3       | ξ,     | 2        | 2     |          |       | 10.02 | 26 | 70.02 |    | 20.02 | <   | 20.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Be       | 5     | ?        | 3     | 2   | 20.02 | l = | 70.02   | UTAT   | 20.02    | Pd    | <0.02    | Rb    | <0.02 | Na | 40.2  | Ъ  | <0.02 | ΥЪ  | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          | -     | 2        | 70.02 | Ca  | <0.02 | He  | <02     | Hg     | 40.2     | P     | <0.02    | Ru    | <0.02 | S  | 40.02 | J  | 300   | <   | 2003                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Id       | 20.02 | 6        | 40.02 | ଜ   | <0.02 | 5   | 40.02   | Mo     | ÷        | ¥     | 2003     | ŝ     | 202   | 0  | 5     | >  |       | 1,  | 10104                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| ω        | 40.02 | 6        | <0.02 | An  | 3     | ş   | 3       | E      |          | ; ;   | TO'NE    | UH    | 70.02 | 0  | 20.05 | Sn | 20.02 | 5   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          |       |          |       |     | 10.01 | 0.1 | 20.05   | ING    | 20.02    | ~     | 40.2     | Sc    | <0.02 | Ta | <0.02 | Т  | <0.02 | 72  | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          |       |          |       |     |       |     |         |        |          |       |          |       |       |    |       |    |       |     | Non- Non- of Concession, Name of Concession, N |

(T)= Target analyte

### Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Sor 1. S

Certified by:

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.

\* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

\* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 57042 Lot # 051722



**Certificate of Analysis** 

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

130925

### 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



### 2.0 PRODUCT DESCRIPTION

Ti

| Product Code:       | Multi Analyte Custom Grade Solution               | on                  |
|---------------------|---------------------------------------------------|---------------------|
| Catalog Number:     | CHEM-QC-4                                         |                     |
| Lot Number:         | S2-MEB711674                                      |                     |
| Matrix:             | 3% (v/v) HNO3<br>3% (v/v) HF                      |                     |
| Value / Analyte(s): | 1 000 μg/mL ea:<br>Boron,<br>Silicon,<br>Titanium | Molybdenum,<br>Tin, |

**Second Source**: Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**ICP** Assay

| ANALYTE<br>Boron, B | CERTIFIED VALUE<br>1 000 ± 7 μg/mL | ANALYTE<br>Molybdenum, Mo | CERTIFIED VALUE<br>1 000 ± 5 μg/mL |          |
|---------------------|------------------------------------|---------------------------|------------------------------------|----------|
| Silicon, Si         | 1 000 ± 7 μg/mL                    | Tin, Sn                   | 1 000 ± 5 μg/mL                    |          |
| Titanium, Ti        | 1 001 ± 6 μg/mL                    |                           |                                    |          |
| Density:            | 1.032 g/mL (meas                   | sured at 20 ± 4 °C)       |                                    |          |
| Assay Information   | ו:                                 |                           |                                    |          |
| ANALYTE             | METHOD                             | NIST SRM#                 |                                    | SRM LOT# |
| В                   | ICP Assay                          | 3107                      |                                    | 110830   |
| Мо                  | ICP Assay                          | 3134                      |                                    | 130418   |
| Si                  | ICP Assay                          | 3150                      |                                    | 130912   |
| Sn                  | ICP Assay                          | 3161a                     |                                    | 140917   |

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

3162a

| Characterization of CRM/RM by Two or More Methods<br>Certified Value, X <sub>CRM/RM</sub> , where two or more methods of characterization are                                                            | Characterization of CRM/RM by One Method<br>Certified Value, X <sub>CRM/RM</sub> , where one method of characterization                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| used is the weighted mean of the results:                                                                                                                                                                | is used is the mean of individual results:                                                                                                                  |
| $X_{CRM/RM} = \Sigma(w_i) (X_i)$                                                                                                                                                                         | X <sub>CRM/RM</sub> = (X <sub>a</sub> ) (u <sub>char a</sub> )                                                                                              |
| X <sub>i</sub> = mean of Assay Method i with standard uncertainty u <sub>char i</sub>                                                                                                                    | X <sub>a</sub> = mean of Assay Method A with                                                                                                                |
| $w_i$ = the weighting factors for each method calculated using the inverse square of the variance:<br>$w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$                                                 | u <sub>char</sub> a = the standard uncertainty of characterization Method A                                                                                 |
| CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>lts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>1/2</sup> | CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> char a + u <sup>2</sup> bb + u <sup>2</sup> lts + u <sup>2</sup> ts) <sup>1</sup> |
| k = coverage factor = 2                                                                                                                                                                                  | k = coverage factor = 2                                                                                                                                     |
| $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method                                | u <sub>char a</sub> = the errors from characterization                                                                                                      |
| ubb = bottle to bottle homogeneity standard uncertainty                                                                                                                                                  | u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty                                                                                         |
| u <sub>lts</sub> = long term stability standard uncertainty (storage)                                                                                                                                    | ults = long term stability standard uncertainty (storage)                                                                                                   |
| u <sub>te</sub> = transport stability standard uncertainty                                                                                                                                               | ute = transport stability standard uncertainty                                                                                                              |

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

### 4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

### 4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

4.0

### 6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ} - 24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

HF Note: This standard should not be prepared or stored in glass.

### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

### 9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

### 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### **11.1 Certification Issue Date**

November 02, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

### 11.2 Lot Expiration Date

### - November 02, 2026

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

### Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

Instructions for QATS Reference Material: ICP-AES ICS

### QATS LABORATORY INORGANIC REFERENCE MATERIAL INTERFERENCE CHECK SAMPLE SET FOR ICP-AES (ICSA WITH ICSB)

**NOTE:** These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

- **APPLICATION:** For use with the CLP SFAM01.0 SOW and revisions.
  - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".

<u>CAUTION:</u> The bottle(s) should be protected from light during storage to ensure the stability of silver which is contained in the ICSB solution. The bottle(s) should be stored at room temperature. **Do not allow the solution(s) to freeze.** 

### (B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY APTIM Federal Services, LLC 2700 Chandler Avenue - Building C Las Vegas, NV 89120

### (C) ANALYSIS OF SAMPLES

The interference check sample set is to be used to verify inter-element and background correction factors of inductively-coupled plasma (ICP) spectrometers. This reference material set consists of two (2) concentrated solutions. The ICSA solution contains the four (4) interferent elements: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

RM ICP-AES ICSA-1211 B-0710 SFAM.docx

Page 1 of 2

QATS Form 20-007F189R01, 01-17-2023



The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.



**ICSA** 

M5126

M5127

M5128

M5129

M5130

### Instructions for QATS Reference Material: ICP-AES ICS

Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for ICP-AES Part A and Part B target analytes when diluted as directed.

Using Class "A" glassware, preparation and analysis must be performed according to the following instructions:

**ICSA-1211, Interferents:** Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSA solution by ICP-AES.

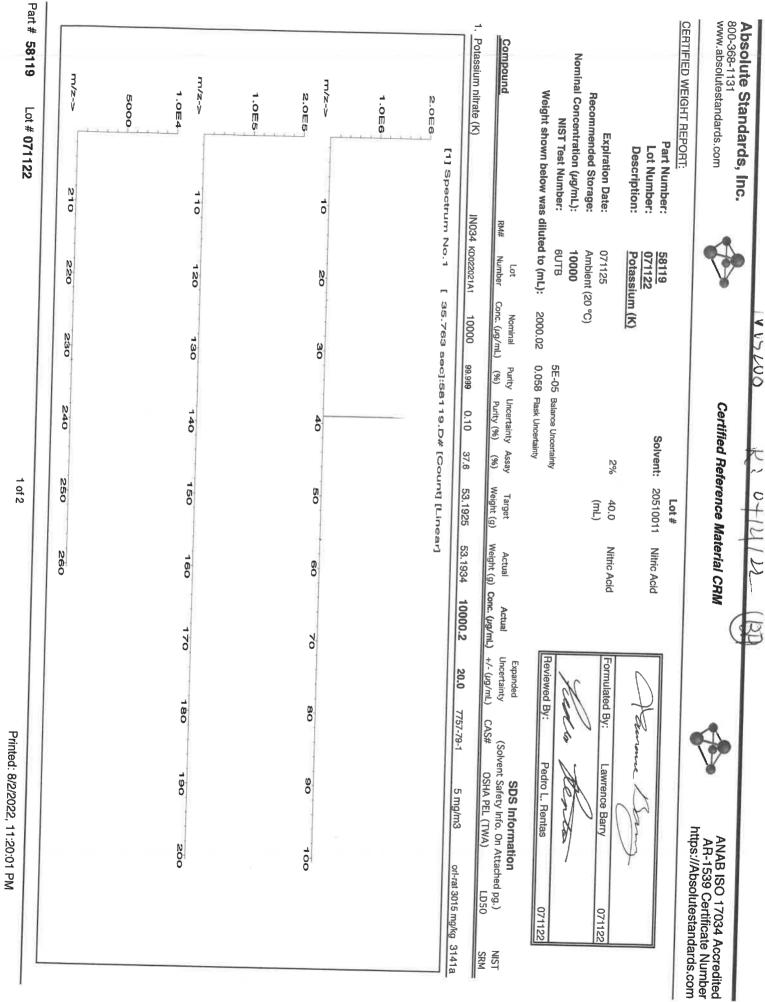
**ICSB-0710, Analytes, mixed with ICSA-1211, Interferents:** Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-AES.

### (D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-AES ICS SOLUTION(S)

The "Certified Value" concentrations of the elements, listed in Table 1 below, were derived from statistically pooled analysis results from the following sources, if available: QATS Laboratory, CLP laboratories, Quarterly Blind (QB)/Proficiency Testing (PT) events, CLP pre-award events, and external referee laboratories.

| Table 1. | "CERTIFIE |                  |                        | ERENCE CH               | IECK SAMPL<br>CSB-0710      | E ICP-AES IO           | CSA-1211,               |
|----------|-----------|------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
| Element  | CRQL      | Part A<br>(µg/L) | Low<br>Limit<br>(µg/L) | High<br>Limit<br>(µg/L) | Part A<br>+Part B<br>(µg/L) | Low<br>Limit<br>(µg/L) | High<br>Limit<br>(µg/L) |
| AI       | 200       | 255000           | 216000                 | 294000                  | 247000                      | 209000                 | 285000                  |
| Sb       | 60        | (0.0)            | -60.0                  | 60.0                    | 618                         | 525                    | 711                     |
| As       | 10        | (0.0)            | -10.0                  | 10.0                    | 104                         | 88.4                   | 120                     |
| Ва       | 200       | (6.0)            | -194                   | 206                     | (537)                       | 337                    | 737                     |
| Be       | 5.0       | (0.0)            | -5.0                   | 5.0                     | 495                         | 420                    | 570                     |
| Cd       | 5.0       | (1.0)            | -4.0                   | 6.0                     | 972                         | 826                    | 1120                    |
| Са       | 5000      | 245000           | 208000                 | 282000                  | 235000                      | 199000                 | 271000                  |
| Cr       | 10        | (52.0)           | 42.0                   | 62.0                    | 542                         | 460                    | 624                     |
| Со       | 50        | (0.0)            | -50.0                  | 50.0                    | 476                         | 404                    | 548                     |
| Cu       | 25        | (2.0)            | -23.0                  | 27.0                    | 511                         | 434                    | 588                     |
| Fe       | 100       | 101000           | 85600                  | 116500                  | 99300                       | 84400                  | 114500                  |
| Pb       | 10        | (0.0)            | -10.0                  | 10.0                    | (49.0)                      | 39.0                   | 59.0                    |
| Mg       | 5000      | 255000           | 216000                 | 294000                  | 248000                      | 210000                 | 286000                  |
| Mn       | 15        | (7.0)            | -8.0                   | 22.0                    | 507                         | 430                    | 584                     |
| Ni       | 40        | (2.0)            | -38.0                  | 42.0                    | 954                         | 810                    | 1100                    |
| Se       | 35        | (0.0)            | -35.0                  | 35.0                    | (46.0)                      | 11.0                   | 81.0                    |
| Ag       | 10        | (0.0)            | -10.0                  | 10.0                    | 201                         | 170                    | 232                     |
| TI       | 25        | (0.0)            | -25.0                  | 25.0                    | (108)                       | 83.0                   | 133                     |
| V        | 50        | (0.0)            | -50.0                  | 50.0                    | 491                         | 417                    | 565                     |
| Zn       | 60        | (0.0)            | -60.0                  | 60.0                    | 952                         | 809                    | 1095                    |

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value  $\pm$  1 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value  $\pm$  15 percent of the listed certified value.



1 of 2

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                                                                                                                                                                                                                                                                                                                    | Certified Reference Material CRM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | *              | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------|
| Instrumental Analysis by Indu                                                                                                                                                                                                                                                                                                                                                            | Mass Spec                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                                                                                                                        |
| <0.02                                                                                                                                                                                                                                                                                                                                                                                    | Trace Metals V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                                                                                                                        |
| 40.02     40.02       40.02     Ca       40.02     Ca | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <0.2           | $\begin{array}{c c} W & < 0.02 \\ U & < 0.02 \\ V & < 0.02 \\ Y & < 0.02 \\ Y & < 0.02 \\ Z n & < 0.02 \\ \end{array}$ |
| Physical Characterization:                                                                                                                                                                                                                                                                                                                                                               | (T)= Target analyte                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                | 1 10.02                                                                                                                |
| Homogeneity: No heterogeneity was ob                                                                                                                                                                                                                                                                                                                                                     | Homogeneity: No heterogeneity was observed in the preparation of this standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Ce             | Certified by:                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ( )            | sold and a                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                          | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in All standard containers are meticulously cleaned prior to use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ated.<br>ed in |                                                                                                                        |
| <ul> <li>Standards are prepared gravimetriculously cleaned prior to use.</li> <li>Standards are certifed (+/-) 0.5% of the stated value, unless</li> <li>All standards should be stored with caps tight and under apping the uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin Measurement Result," NIST Technical Note 1297, U.S. Govern</li> </ul>                        | Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result." NIST Technical Note 1305                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                          | This is the second |                |                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                          | D.C. (1994).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                                                                                                                        |



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R : 以120 2 [

Instructions for QATS Reference Material: Inorganic ICV Solutions

### QATS LABORATORY INORGANIC REFERENCE MATERIAL INITIAL CALIBRATION VERIFICATION SOLUTIONS (ICV1, ICV5, AND ICV6)

**NOTE:** These instructions are for advisory purposes only. If any apparent conflict exists between these instructions and the analytical protocol or your contract, disregard these instructions.

- APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.
  - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Metals in Dilute Acidic or Cyanide in Basic Aqueous Solutions HAZARDOUS MATERIAL

> Safety Data Sheets Available Upon Request



### (A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more Aqueous Inorganic Reference Materials containing various analyte concentrations. ICV1 and ICV5 are in a matrix of dilute nitric acid. ICV6 is in a matrix of dilute basic solution. For the reference material source in reporting ICVs use "USEPA". For the reference material lot number for the ICV1, ICV5, and ICV6 solutions use "ICV1-1014", "ICV5-0415", and "ICV6-0400", respectively.

### (B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to Mr. Keith Strout, APTIM Federal Services, LLC, at (702) 895-8722. If requested, return the chain-of-custody record with appropriate annotations and signatures to the address provided below.

### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY APTIM Federal Services, LLC 2700 Chandler Avenue - Building C Las Vegas, NV 89120

### (C) ANALYSIS OF SAMPLES

The Initial Calibration Verification Solutions (ICVs) are to be used to evaluate the accuracy of the initial calibrations of ICP, AA, and Cyanide colorimetric instruments, and are to be used with the CLP SOWs and revisions. The values for each element in the ICVs are listed below in  $\mu g/L$  (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014 For ICP-AES analysis, use a 10-fold dilution by pipetting 10 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.

RMs ICV 1, 5, 6 SFAM.docx

Page 1 of 2

QATS Form 20-007F188R00, 04-19-2021



The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.



### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program"

AP11MInstructions for QATS Reference Material: Inorganic ICV SolutionsICV1-1014For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate<br/>into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.ICV5-0415For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting<br/>1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume<br/>with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K2Cr2O7<br/>and 5% (v/v) nitric acid.ICV6-0400For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6<br/>concentrate into a 100 mL volumetric flask and dilute to volume with Type II water.<br/>Distill this solution along with the samples before analysis. The cyanide concentrate<br/>is prepared from K3Fe(CN)6, Type II water, and 0.1 % sodium hydroxide, and will<br/>decompose rapidly if exposed to light.

NOTE: USE TYPE II WATER AND HIGH-PURITY ACIDS FOR ALL DILUTIONS.

### (D) CERTIFIED CONCENTRATIONS OF QATS ICV1, ICV5, AND ICV6 SOLUTIONS

|         | ICV1-1014                                        |                                                  |
|---------|--------------------------------------------------|--------------------------------------------------|
| Element | Concentration (µg/L)<br>(after 10-fold dilution) | Concentration (µg/L)<br>(after 50-fold dilution) |
| AI      | 2500                                             | 500                                              |
| Sb      | 1000                                             | 200                                              |
| As      | 1000                                             | 200                                              |
| Ba      | 520                                              | 100                                              |
| Be      | 510                                              | 100                                              |
| Cd      | 510                                              | 100                                              |
| Ca      | 10000                                            | 2000                                             |
| Cr      | 520                                              | 100                                              |
| Co      | 520                                              | 100                                              |
| Cu      | 510                                              | 100                                              |
| Fe      | 10000                                            | 2000                                             |
| Pb      | 1000                                             | 200                                              |
| Mg      | 6000                                             | 1200                                             |
| Mn      | 520                                              | 100                                              |
| Ni      | 530                                              | 110                                              |
| K       | 9900                                             | 2000                                             |
| Se      | 1000                                             | 200                                              |
| Ag      | 250                                              | 50                                               |
| Na      | 10000                                            | 2000                                             |
| TI      | 1000                                             | 210                                              |
| V       | 500                                              | 100                                              |
| Zn      | 1000                                             | 200                                              |

|         | ICV5-0415                                         |                 | ICV6-0400                                         |
|---------|---------------------------------------------------|-----------------|---------------------------------------------------|
| Element | Concentration (µg/L)<br>(after 100-fold dilution) | Analyte         | Concentration (µg/L)<br>(after 100-fold dilution) |
| Hg      | 4.0                                               | CN <sup>.</sup> | 99                                                |

| 1 023 Multed to (<br>2 072 1<br>1000 1000 1000 1000 1000 1000 1000 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expiration Dete:         072125         2%         40.0         Nithic Add           neradid Storage:         Ambient (20 °C)         SE-05 Baaroe Uncertainty         (mL)         Nithic Add           ST Test Number         GUTB         SE-05 Baaroe Uncertainty         SE-05 Baaroe Uncertainty         Actual         Number         Actual                                                                                              |
| NIST fest Number:         6UTB         SE-05         Bance Unordary           Lot         Nominal         Purity Uncertainty Assy         Taget         Actual           Bance Intrate (Ba)         IN023 excame         1000         99.99         0.10         E23         3.82417         3.82426           1:0E8         [1]         Spectrum No.1         [1]         12.514         sec):69156.0/f         [Count] [Linear]           2:0E8         11.0E8         11.0E8         1         20         30         40         50         60           2:0E5         10         120         130         140         150         160         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50                                                                                                                                                                                                                            |
| Compound         New         Number         Core:         (up/m.)         (%)         Parity (%)         (%)         Weight (0)         Weight (0) |
| [1] Spectrum No.1 [ 12.514 sec]:58156.D# [Count] [Linear]<br>E8<br>E5<br>E5<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6<br>E6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| 10<br>120<br>120<br>130<br>140<br>150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| ,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| m/z-> 210 220                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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Absolute Standards, Inc. www.absolutestandards.com 800-368-1131



ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

# Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|        |   |     |       |    | - Malan |    |       |       |       |     |       |     |       | a the second sec |       |    |       |            |              |
|--------|---|-----|-------|----|---------|----|-------|-------|-------|-----|-------|-----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|-------|------------|--------------|
| <0.02  |   | p,  | <0.02 | Dy | <0.02   | Hf | <0.02 | E     | <0.02 | ž   | <0.02 | Ŀ   | 000   | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | c 07  |    | W V   | 1 111      | 0000         |
| \$0.0P |   | Ğ   | <0.2  | 눱  | <0.02   | Ho | <0.02 | Lu    | <0.02 | ęz. | <0.02 | - d | 2007  | 3 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1 200 | 2  | 20.02 | A :        |              |
| 02     |   | ,ei | <0.02 | Бu | <0.02   | ŗ  | <0.07 | ŷ     | 1002  | č   | 000   | 24  | 1000  | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 70.02 | 5  | 20.05 | 2          | <b>40.02</b> |
| F      |   | 0   | 000   | 3  |         |    | 1010  | 9.1   | TO'O' | ŝi  | 70.02 | 2   | 70.02 | A0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <0.02 | F  | <0.02 | >          | <u>6.02</u>  |
| + .    | - | 3   | 70'N2 | 3  |         | 늭  | <0.02 | MN    | <0.02 | Ъ   | <0.02 | RЪ  | <0.02 | Na                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 40.2  | Ē  | <0 UD | 42         | 0007         |
| 0.0    |   | 1   | <0.02 | Ga | <0.02   | Че | <0.2  | Hg    | <0.2  | ۵.  | <0.02 | Ru  | <0.02 | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 007   | ł  |       | ; >        | 1000         |
| 20.0>  |   | 0   | <0.02 | e  | <0.02   | La | <0.02 | Mo    | <0.02 | å   | 2007  |     |       | 5 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |    | 70.02 | -          | 20.02        |
| <0.02  | 1 | jă, | <0.02 | An | 000     | á  | 2007  | PIN I |       | : > | 20.00 |     | 70.02 | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 70'02 | 10 | <0.U2 | <b>U</b> 7 | <0.02        |
|        | 1 |     |       | mL | TRA     | 2  | 20.02 | DNT   | ZUNZ  | 2   | 202   | ŝ   | <0.02 | E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <0.02 | i  | 2002  | 7,         | 2007         |

## Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

ar R

- \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
  - All standard containers are meticulously cleaned prior to use.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
  - Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All Standards should be stored with caps tight and under appropriate laboratory conditions.
- \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Nitric Acid CMOS





M5402 M5403 M5404 M5405 M5406 M5407

Material No.: 9606-03 Batch No.: 22C0462001 Manufactured Date: 2022-02-11 Retest Date: 2027-02-10 Revision No.: 0

### **Certificate of Analysis**

| Test                              | Specification | Result      |
|-----------------------------------|---------------|-------------|
| Assay (HNO₃)                      | 69.0 - 70.0 % | 69.4 %      |
| Appearance                        | Passes Test   | Passes Test |
| Color (APHA)                      | ≤ 10          | 5           |
| Residue after Ignition            | ≤ 2 ppm       | < 1 ppm     |
| Chloride (Cl)                     | ≤ 0.08 ppm    | < 0.03 ppm  |
| Phosphate (PO <sub>4</sub> )      | ≤ 0.10 ppm    | < 0.03 ppm  |
| Sulfate (SO <sub>4</sub> )        | ≤ 0.2 ppm     | < 0.2 ppm   |
| Trace Impurities - Aluminum (Al)  | ≤ 40.0 ppb    | < 1.0 ppb   |
| Arsenic and Antimony (as As)      | ≤ 5.0 ppb     | < 2.0 ppb   |
| Trace Impurities - Barium (Ba)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Beryllium (Be) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Bismuth (Bi)   | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities - Boron (B)      | ≤ 10.0 ppb    | < 5.0 ppb   |
| Trace Impurities - Cadmium (Cd)   | ≤ 50 ppb      | < 1 ppb     |
| Trace Impurities - Calcium (Ca)   | ≤ 50.0 ppb    | 1.2 ppb     |
| Trace Impurities - Chromium (Cr)  | ≤ 30.0 ppb    | 1.7 ppb     |
| Trace Impurities - Cobalt (Co)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Copper (Cu)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Gallium (Ga)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Germanium (Ge) | ≤ 20 ppb      | < 10 ppb    |
| Trace Impurities - Gold (Au)      | ≤ 20 ppb      | < 5 ppb     |
| Heavy Metals (as Pb)              | ≤ 100 ppb     | < 50 ppb    |
| Trace Impurities - Iron (Fe)      | ≤ 40.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Lead (Pb)      | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities - Lithium (Li)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Magnesium (Mg) | ≤ 20 ppb      | < 1 ppb     |
| Trace Impurities - Manganese (Mn) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Nickel (Ni)    | ≤ 20.0 ppb    | < 5.0 ppb   |
| >>> Continued on page 2 >>>       |               |             |

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC

100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700





### Material No.: 9606-03 Batch No.: 22C0462001

| Test                                     | Specification | Result     |
|------------------------------------------|---------------|------------|
| Trace Impurities - Niobium (Nb)          | ≤ 50.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Potassium (K)         | ≤ 50 ppb      | < 10 ppb   |
| Trace Impurities - Silicon (Si)          | ≤ 50 ppb      | < 10 ppb   |
| Trace Impurities - Silver (Ag)           | ≤ 20.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Sodium (Na)           | ≤ 150.0 ppb   | < 5.0 ppb  |
| Trace Impurities - Strontium (Sr)        | ≤ 30.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Tantalum (Ta)         | ≤ 10.0 ppb    | < 5.0 ppb  |
| Trace Impurities - Thallium (Tl)         | ≤ 10.0 ppb    | < 5.0 ppb  |
| Trace Impurities - Tin (Sn)              | ≤ 20.0 ppb    | < 10.0 ppb |
| Trace Impurities - Titanium (Ti)         | ≤ 10.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Vanadium (V)          | ≤ 10.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Zinc (Zn)             | ≤ 20.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Zirconium (Zr)        | ≤ 10.0 ppb    | < 1.0 ppb  |
| Particle Count - 0.5 $\mu m$ and greater | ≤ 60 par/ml   | 7 par/ml   |
| Particle Count - 1.0 µm and greater      | ≤ 10 par/ml   | 2 par/ml   |
|                                          |               |            |

>>> Continued on page 3 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700 Nitric Acid CMOS





Material No.: 9606-03 Batch No.: 22C0462001

| Test | Specification | Result |  |
|------|---------------|--------|--|
|      |               |        |  |

For Microelectronic Use Country of Origin: USA Packaging Site: Phillipsburg Mfg Ctr & DC

James Techie Jamie Ethier Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Page 3 of 3

| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | By: Lawrence Barr<br>By: Lawrence Barr<br>Jy: Pedro L. Renta<br>SDS Info.<br>(Solvent Safety Info.                                                                                                                                                                                             | 7790-69-4                    |                                                                                                                            | Printed: 1/18/2023, 4:01:43 PM |
|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| A                                                                                        | Formulated<br>Formulated<br>Reviewed E<br>Actual<br>Uncertainty                                                                                                                                                                                                                                | -H - H                       | ۶ <u>۲</u>                                                                                                                 |                                |
| aterial CRM                                                                              | Nitric Acid<br>Nitric Acid<br>Actual<br>Actual                                                                                                                                                                                                                                                 |                              | ar]<br>160<br>280                                                                                                          |                                |
| leference M                                                                              | 20510011<br>20.0<br>(mL)<br>(mL)<br>Target                                                                                                                                                                                                                                                     | 100.0134                     | 0 0 0 0 220 0 220 0 220 0 220 0 220 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0                                                  | 1 of 2                         |
| Certified Reference Material CRW                                                         | Solvent:<br>Solvent:<br>Solvent:<br>2%<br>5E-05 Balance Uncertainty<br>0.058 Rask Uncertainty<br>Purity Uncertainty Assay<br>(%) Purity (%) (%)                                                                                                                                                | 10.0                         | 8103:D#[C<br>240 240 240 240                                                                                               |                                |
|                                                                                          | C)<br>C)<br>5E-05 B<br>1000.12 0.058 F<br>Nominal Purity t<br>no. (ug/mL) (%)                                                                                                                                                                                                                  | 88.999                       | 9.619 sec]:58103:<br>30<br>130<br>14<br>230<br>24<br>14                                                                    |                                |
|                                                                                          |                                                                                                                                                                                                                                                                                                |                              |                                                                                                                            |                                |
| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    | CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Lot Number:<br>Description:<br>Expiration Date:<br>Thilum (<br>070622<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>Nominal Concentration (µg/mL):<br>Neight shown below was diluted to (mL):<br>Compound RM# Number | 1. Lithium nitrate (Li) IN01 | [1] Spectrum No.1<br>1.0E6<br>5.0E5<br>m/z-> 10<br>500<br>500<br>500<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10 |                                |

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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

|    |       |    |       |    |       |      |       |         |       |    | and the second s | and the second se | and |     | The state of the s |        |       |            |       |
|----|-------|----|-------|----|-------|------|-------|---------|-------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|------------|-------|
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| Sb | <0.02 | లి | ⊲0.2  | Ъ  | <0.02 | Ho   | <0.02 | La<br>L | ≤0.0> | ź  | ≤0:0>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Re                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <0.0>                                   | 3   | €0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | e<br>H | <0.02 | Þ          | 4002  |
| S  | ₫2    | ථ  | <0.02 | 围  | <0.02 | H    | 0.02  | Mg      | 10.0> | ő  | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Rh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <0.02                                   | Ag  | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | F      | <0.02 | >          |       |
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| ė  | ≤0.01 | ර  | <0.02 | පී | <0.02 | £    | <02   | He      | <02   | Δ. | <0,00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Ru                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 89                                      | 3   | 200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Ę      | 200   | 2 >        | 70.00 |
|    | <0.02 | ථ  | <0.02 | ප  | <0.02 | el   | A002  | Ň       | 20.02 | Å  | 200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | , e                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 200                                     | 5 0 | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1 5    |       | - 1<br>- 1 | 70105 |
| 6  | <0.02 | õ  | <0.02 | Au | <0.02 | i de | 0.02  | PN      | <0.02 | ×  | <02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                         | ρĘ  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | i F    |       | 5 4        |       |

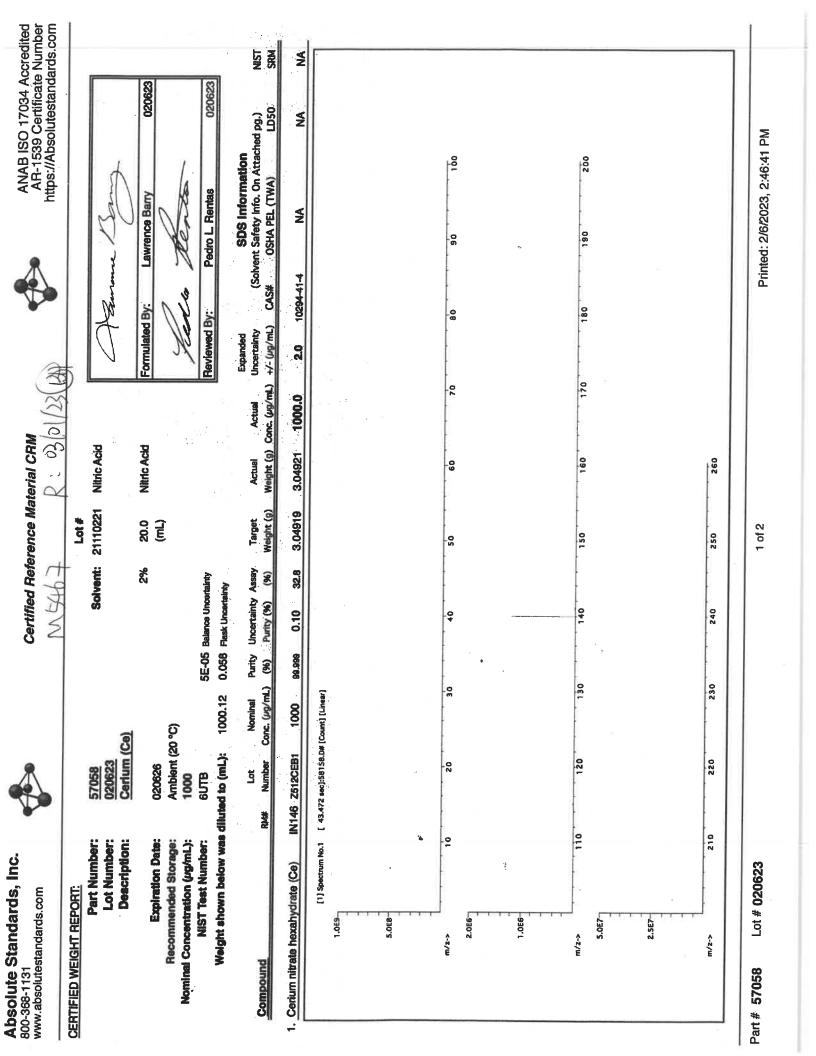
**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

- The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
  - All standard containers are meticulously cleaned prior to use.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). All Standards should be stored with caps tight and under appropriate laboratory conditions.

Lot # 070622 Part # 57103



Absolute Standards, Inc. www.absolutestandards.com 800-368-1131



# Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);

|                  | 42 Hr 488 W |       | <0.02 Te <0.02 U | Ag <0.02 T1 <0.02 V <0.02 | <02 Th <0.02 Yb | <0.02 Tm <0.02 Y | <0.02 Sn <0.02 Zn | <0.02 Ti <0.02 Zr |
|------------------|-------------|-------|------------------|---------------------------|-----------------|------------------|-------------------|-------------------|
| (mL)             | 002         | 70.05 | 20.02            | <0.02                     | <0.02           | <0.02            | <0.02             | <0.02             |
| igu,             | đ           | 1     | ž                | Rh                        | Rb              | Ru               | Sm                | ŝ                 |
| V ILP-MS         | 00          |       | 20.05            | <0.02                     | <0.02           | <0.02            | <0.02             | <02               |
|                  | in in       |       | 2                | °S<br>O                   | РД              | <u>a</u> ,       | Ł                 | Х                 |
| ventication by I | 002         | 1000  | 70'02            | €0.01                     | <0.02           | <02              | <0.02             | <0.02             |
| Metals           |             | ٩,    | 3                | Mg                        | Mn              | Hg               | Mo                | PN                |
| I race me        | 002         | 4000  | 20,02            | <0.02                     | <0.02           | <b>40</b> 2      | <0.02             | <0.02             |
|                  | Hf          |       | 윤                | ų                         | Ц               | Fe               | La                | £                 |
|                  | 4002        |       | 20102            | <0.02                     | <0.02           | <0.02            | <0.02             | <0.02             |
|                  | M           | 5 1   | 뉙                | 圕                         | З               | e<br>B           | 3                 | Au                |
|                  | 400         |       | 2.02             | L                         | <0.02           | <0.02            | <0.02             | <0.02             |
|                  | 5           | \$ ,  | 3                | ප                         | ర               | 5                | 8                 | ð                 |
|                  | 000         | 20.0  | 20:02            | <b>4</b> 0.2              | <0.02           | €0.01            | <0.02             | <0.02             |
|                  | AI          |       | 2                | As                        | Ba              | Be               | 盗                 | <b>P</b>          |

(T)= Target analyte

## Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Ser P

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

All standard containers are meticulously cleaned prior to use.

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

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\* All standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | 031523                                                                                                                                                                                                                                                                 | on<br>ttached pg.) NIST<br>LD50 SRM<br>ont-rat >2000mo/kg 3109a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Ő                                         | O<br>O<br>N                                                                |
|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------|
| ARA                                                                                      | Ped X Gio                                                                                                                                                                                                                                                              | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br>CSHA PEL (TWA) LD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>CD5C<br>C | -0<br>0                                   | 190<br>200                                                                 |
| MUXCITI                                                                                  | Formulated By:<br>Reviewed By:                                                                                                                                                                                                                                         | Expanded<br>Uncertainty<br>+/- (µg/mL) CAS:<br>20.0 471-34                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Q<br>R                                    | 170                                                                        |
| 120                                                                                      |                                                                                                                                                                                                                                                                        | Actual Actual<br>Weight (g) Conc. (ug/mL)<br>75.2093 10001.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | So                                        | 1900<br>1900<br>1900                                                       |
| Certified Reference Material CRM                                                         | Lot #<br>Solvent: 21110221<br>2% 60.0<br>(mL)<br>Uncertainty<br>sentainty                                                                                                                                                                                              | Uncertainty Assay Target<br>Purity (%) (%) Weight (g)<br>0.10 38.9 75.1990                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.D# [Count] [Line                        | 140 150<br>240 250                                                         |
| NV5497                                                                                   | 5E-05 Balance<br>00.41 0.058 Flask Un                                                                                                                                                                                                                                  | Nominal Purity Uncertainty<br>Conc. ( <i>ug/m</i> L) (%) Purity (%)<br>10000 99.999 0.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30 30 30 30 30 30 30 30 30 30 30 30 30 3  | - 30<br>5<br>7<br>30<br>7<br>30<br>7<br>30                                 |
|                                                                                          | 58120<br>031523<br>031526<br>031526<br>Ambient (20<br>10000<br>6UTB<br>6UTB<br>6UTB                                                                                                                                                                                    | Lot A<br>RM# Number Con                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10 To 1 12                                | 220                                                                        |
| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    | CERTIFIED WEIGHT REPORT:<br>Part Number: 58120<br>Lot Number: 031523<br>Description: 031526<br>Expiration Date: 031526<br>Recommended Storage: Ambient (2<br>Nominal Concentration (µg/mL): 10000<br>NIST Test Number: 6UTB<br>Weight shown below was diluted to (mL): | Compound<br>1. Calcium carbonate (Ca)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2.0E4<br>1.0E4<br>3.0E4<br>5.0E4<br>2.5E4 | T.OES<br>1.0ES<br>5.0E4<br>m/2-> 2<br>m/2-> 2<br>Part # 58120 Lot # 031523 |

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Absolute Standards, inc. 800-368-1131 www.absolutestandards.com

Certified Reference Material CRM



Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|   | <0.02        | 3  | <0.02        | ĥ  | <0.02        | Hf | <0.02 | Ц  | <0.02        | z  | <0.02         | Ł  | <0.02 | ŝ  | <0.2  | £  | <0.02 | × | <0.02 |
|---|--------------|----|--------------|----|--------------|----|-------|----|--------------|----|---------------|----|-------|----|-------|----|-------|---|-------|
| _ | <0.02        | లి | ٣            | 固  | 40.02        | Bo | 40.02 | 3  | <u>60.05</u> | ź  | <0.02         | Se | <0.02 | ŝ  | <0.02 | Te | <0.02 | Þ | 40.02 |
|   | <b>40</b> 12 | ථ  | 40.02        | a  | <b>40.02</b> | h  | <0.02 | Mg | ±0.01        | ő  | <u>60</u> .02 | 2  | <0.02 | Ag | <0.02 | F  | <0.02 | > | <0.02 |
| _ | €0.05        | ඊ  | <0.02        | 3  | 40.02        | 놰  | <0.02 | Å  | €0.02        | æ  | <0.02         | å  | <0.02 | Na | <0.2  | Ę  | <0.02 | ይ | 40.02 |
|   | <0.01        | q  | <0.02        | g  | 40.02        | Ę  | 402   | Hg | <0.2         | ۵. | <0.02         | Ru | <0.02 | S  | €0.02 | Ę  | <0.02 | × | <0.02 |
|   | ≤0.02        | გ  | <u>60.02</u> | ප් | 40.02        | 3  | 0.02  | Mo | <0.02        | æ  | <0.02         | Sn | <0.02 | S  | <0.02 | Sn | <0.02 | Ŋ | <0.02 |
|   | ≤0.02        | ð  | <u>60.05</u> | Au | 000          | £  | <0.02 | PN | <u>40.02</u> | Å  | 40.2          | ŝ  | <0.02 | T. | ≤0.02 | Ę  | <0.02 | Ň | 2002  |

**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.

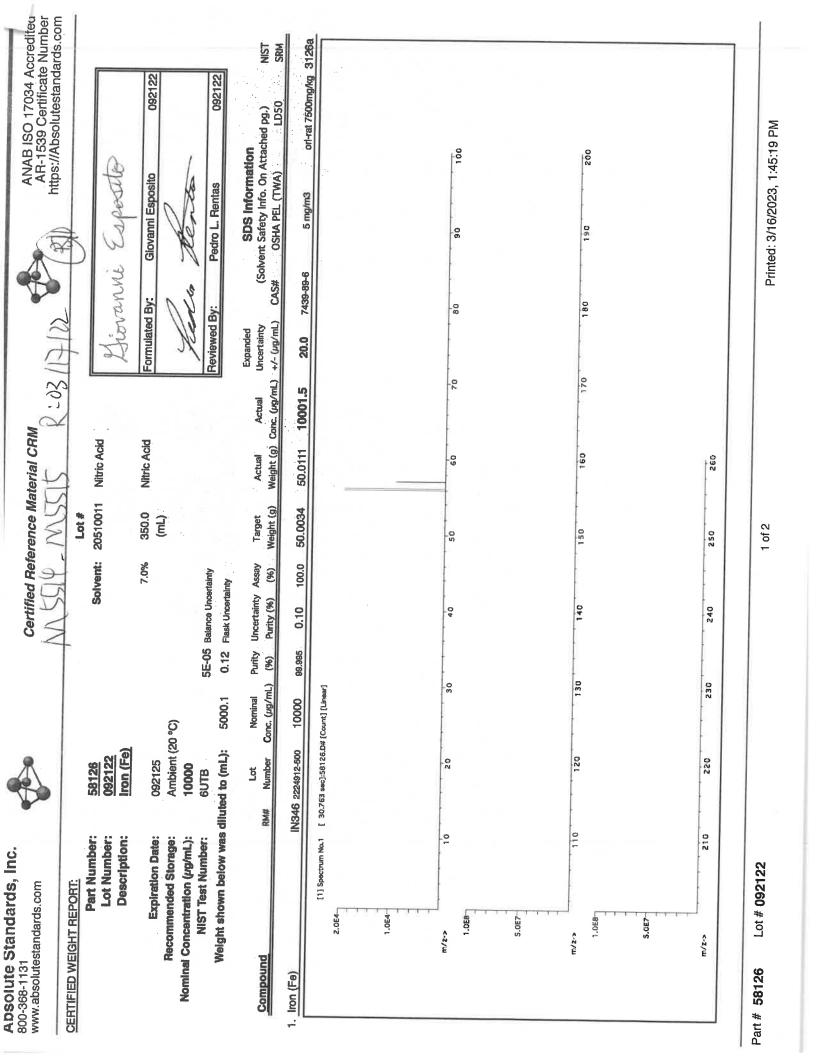
Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

\* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions.

\* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58120 Lot # 031523



Absolute Standards, Inc. www.absolutestandards.com 800-368-1131

Certified Reference Material CRM



Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

| E  | <0.02 | G  | <0.02 | Ŋ  | <0.02 | Hf | <0.02     | п  | <0.02        | ÿ   | <0.10        | 놊  | <0.02 | Se | 40.2  | 4  | <0.02 | M       | <0.02 |
|----|-------|----|-------|----|-------|----|-----------|----|--------------|-----|--------------|----|-------|----|-------|----|-------|---------|-------|
| _  | <0.02 | ບຶ | 402   | 斑  | 40:02 | Но | 40.02     | 3  | 40.02        | ĝ   | <0.02        | Re | <0.02 | ន  | <0.02 | Ъ. | €0.05 | D       | <0.02 |
| As | 02    | ථ  | <0.02 | a  | <0.02 | a  | <0.02     | Mg | €0,01        | ő   | €0.02        | Rh | ≤0.02 | Ag | 40.02 | F  | <0.0> | >       | <0.02 |
| _  | ≤0.02 | ඊ  | 40.02 | 3  | ≤0:02 | н  | 60<br>102 | Mn | <0.10        | R   | <u>60.02</u> | Rb | ≤0.02 | R  | 40.2  | f  | ≤0.02 | ۹۶<br>۲ | ≤0.02 |
|    | 40.01 | ບັ | <0.05 | 9  | <0.02 | Ъ. | 402       | Hg | <02          | الم | <0.02        | Ru | <0.02 | S. | <0.02 | Ę  | 40,02 | ۲       | ≤0.02 |
| _  | 40.02 | රී | <0.10 | පී | 0.10  | La | <0.02     | Mo | <u>40.02</u> | æ   | <0.02        | Sm | <0.02 | s  | <0.02 | Sn | <0.02 | Z       | <0.05 |
|    | <0.02 | 8  | <0.10 | Au | <0.02 | £  | <0.02     | PN | <b>20.02</b> | M   | <b>402</b>   | 3  | 40.02 | f  | <0.02 | F  | <0.02 | 77      | <000× |

**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

All standard containers are meticulously cleaned prior to use.

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions.

\* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Lot # 092122 Part # 58126



### MATERIAL CERTIFICATE OF COMPLIANCE

DATE: JUNE 12, 2023

CUSTOMER:PCI SCIENTIFIC SUPPLY, INCPURCHASE ORDER NO.6054931CATALOG NO.BOI5021-450LPRODUCT DESCRIPTION:BOILING STONES, TFE, 454GMSQUANTITY:10 EACH

SPECIFICATION (S): Made from Virgin PTFE Resin

LOT NO.

We certify that we have complied with the terms and conditions of the above Purchase Order and the Part Specifications in the manufacturing of the above product.

W126678

Valu

Laura Valencia Quality Assurance Inspector

F:U:J:GF:PCISCI:COC-55118-BOI5021-061223

### CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

### **CERTIFICATE OF ANALYSIS**

Date: 8/3/2022

M5631 M5632 M5633 M5634 Lot No 820803

Hydrogen Peroxide, ACS Reagent Grade

| TEST                       | MAXIMUM LIMITS                                       | RESULT        |
|----------------------------|------------------------------------------------------|---------------|
| Appearance                 | Colorless and free from suspended matter or sediment | Pass          |
| Assay                      | 29-32%                                               | 31.4%         |
| Color (APHA)               | 10                                                   | 5             |
| Residue after Evaporation  | 0.002%                                               | .0001%        |
| Titratable Acid            | 0.0006 meq/g                                         | < .0006 meq/g |
| Chloride (Cl)              | 2 ppm                                                | < 1 ppm       |
| Nitrate (NO <sub>3</sub> ) | 2 ppm                                                | < 1 ppm       |
| Phosphate                  | 2 ppm                                                | < 1 ppm       |
| Sulfate (SO <sub>4</sub> ) | 5 ppm                                                | < .5 ppm      |
| Ammonium (NH4)             | 5 ppm                                                | < 1 ppm       |
| Heavy Metals (as Pb)       | 1 ppm                                                | < .1 ppm      |
| lron (Fe)                  | 0.5 ppm                                              | < .1 ppm      |
| Sodium Stannate            | 200 – 300 ppb                                        | Pass          |

\*\*\*Our Hydrogen Peroxide is considered un-stabilized because it is very slightly stabilized with Sodium Stannate, 500 ppb maximum, just for safety purposes.

Date of MFG: 8/2022 Retest date: 8/2024

Gína M. Rambo Office Manager

CORCO CHEMICAL CORPORATION. 299 CEDAR LANE. FAIRLESS HILLS, PA 19030. 215-295-5006. FAX 215-295-0781

| m/z->   | N.5<br>6 | m/z-≯<br>5.0E5                                                | ភ.<br>០<br>ពេស | m/z-><br>1.0≣6 | 5000 | 1.0트4                                 | 1. Chromium(III) nitrate nonahydrate (Cr) | Compound                                                      | Volume sho                              | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (Jug/mL): | Par<br>De                                   | CERTIFIED WEIGHT REPORT: | www.absolutestandards.com                                   |
|---------|----------|---------------------------------------------------------------|----------------|----------------|------|---------------------------------------|-------------------------------------------|---------------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------|--------------------------|-------------------------------------------------------------|
| N<br>O  |          | 110                                                           |                | <b>1</b>       |      | [1] Spectrum No.1                     |                                           | Pa                                                            | Volume shown below was diluted to (mL): | Expiration Date:<br>nended Storage:<br>ntration (µg/mL):                    | Part Number:<br>Lot Number:<br>Description: | 0                        | 3                                                           |
| 220     |          | 120                                                           |                | N.<br>O        |      | -                                     | 58124 071122                              | Part Lot<br>Number Number                                     | filuted to (mL):                        | 060526<br>Ambient (20 °C)<br>1000                                           | <u>58024</u><br>060523<br>Chromium (Cr)     |                          | A                                                           |
| 230     |          | 130                                                           |                | ů.<br>O        |      | 31,393 80                             | 0.1000                                    | Dilution<br>Factor                                            | 2000.02                                 |                                                                             | 1 (Cr)                                      |                          | MS                                                          |
| 240     |          | 140                                                           |                |                |      | c]:57024.                             | 200.0 0.084                               | Initial Uncertainty<br>Vol. (mL) Pipette (mL)                 | 0.058 Flask U                           |                                                                             |                                             |                          | MS658                                                       |
|         |          |                                                               |                | ð.             |      | 31,393 sec]:57024.D# [Count] [Línear] | 084 1000                                  | Uncertainty Nominal<br>Pipetta (mL) Conc. (µg/mL)             | Flask Uncertainty                       |                                                                             | 21110221<br>2.0%                            | Lot #                    | ) A                                                         |
| N<br>50 |          | 」<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>() |                | S              |      | t] [Linear]                           | 10 10000.1                                | nał Initial<br>g/mL) Conc. (µg/mL)                            |                                         | (mL)                                                                        | 221 Nitric Acid<br>% 40.0                   | # Solvent:               |                                                             |
| 200     |          | 160                                                           |                | 0              |      | ş                                     | 0.1 <b>1000.0</b>                         | al Final<br>rg/mL) Conc. (µg/mL)                              |                                         | Ľ                                                                           | Acid<br>.0 Nitric Acid                      | ent:                     | 123                                                         |
|         |          | 170                                                           |                | 70             |      |                                       | 0.0 2.2                                   | Expanded<br>al Uncertainty<br>ig/mL) +/- (µg/mL)              | Lineviewed by.                          | X                                                                           | Acid Formulated By:                         |                          | 1                                                           |
|         |          | 180                                                           |                | 8-<br>0-       |      | 1                                     | 7789-02-8                                 | ) CAS                                                         |                                         | a la                                                                        | Horner                                      |                          |                                                             |
|         |          | 190                                                           |                | Ŷ              |      |                                       |                                           | jolvent<br>Os                                                 |                                         | ten                                                                         | Lawrence Barry                              |                          | Y                                                           |
|         |          | 20-<br>00-                                                    |                | 100            |      |                                       | 0.5 mg(Cr)/m3 ort-                        | SDS Information<br>nt Safety Info. On Attac<br>OSHA PEL (TWA) |                                         | Ø                                                                           | nce Barry                                   |                          | AH-15:<br>https://Ab                                        |
|         |          | 0                                                             |                | o              |      |                                       | ort-rat 3250 mg/kg                        | ched pg.)<br>LDS0                                             | 00000                                   | 00050                                                                       | 060523                                      |                          | AH-1539 Certificate Number<br>https://Absolutestandards.com |
|         |          |                                                               |                |                |      |                                       | g 3112a                                   | NIST                                                          |                                         | ٥ <u> </u>                                                                  | [ω]                                         | 1                        | te Numbe<br>dards.com                                       |

Part # 58024 Lot # 060523

1 of 2

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| Absolute<br>800-368-1131<br>www.absolute                                            | Absolute Standards, Inc.       Certified Reference         800-368-1131       www.absolutestandards.com         www.absolutestandards.com       instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | י, Inc.                                                                                                                                      | ctively                                                                   | V Coupled                                                                                                                 | Plasm                                                                              | na Mass S                                                                                                             | Ce Ce                                                           | rtified Ru                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | eferer<br>CP-Mi                         | Certified Reference Material Ci                                               | rial C                    | RM                                                                                          |                                        |                |   |        |               | https      | AB ISO 170<br>I-1539 Cert<br>://Absolute | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------|----------------------------------------|----------------|---|--------|---------------|------------|------------------------------------------|------------------------------------------------------------------------------------------|
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                              |                                                                           |                                                                                                                           |                                                                                    | Trace N                                                                                                               | Metals                                                          | Verification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                         | by ICP-MS                                                                     |                           | /g/mL)                                                                                      |                                        |                |   |        |               |            |                                          |                                                                                          |
| A                                                                                   | -0.02 Cd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 40.02                                                                                                                                        | Dy                                                                        | 40.02                                                                                                                     | Hf                                                                                 | 40.02                                                                                                                 |                                                                 | 40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Ŋ                                       | 40.02                                                                         |                           | A).02                                                                                       | - Se                                   | ð              |   | 7      | A 13          | W          | CUL                                      |                                                                                          |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 40.02                                                                                                                                        | E Dy                                                                      | <0.02                                                                                                                     | Ho                                                                                 | 4).02<br>(0).02                                                                                                       | 달드                                                              | 4 4<br>22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Ş</b> 3                              | 40.02                                                                         | R P                       | 40.02<br>40.02                                                                              | Si Se                                  | 4 A A          | - | ч<br>Ч | 0.02<br>0.02  | u W        | <0.02                                    |                                                                                          |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 40.02                                                                                                                                        | ) 달                                                                       | -40.02                                                                                                                    | 5                                                                                  | <0.02                                                                                                                 | Mg                                                              | <0.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | , õ                                     | 40.02                                                                         | Rh                        | <0.02                                                                                       | Ag                                     | <0.02          |   |        | 40.02         | <b>v</b> ( | <0.02                                    |                                                                                          |
| R Ba                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -T<br>T                                                                                                                                      | ନ୍ଦୁ ହ                                                                    | A 0.02                                                                                                                    | 1) H                                                                               | 4. 6. B                                                                                                               | F. M                                                            | A. 0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | P Pd                                    | 3 8                                                                           | R RB                      | A 0.02                                                                                      | e Na                                   | 202            |   | 1 2    | 8<br>8<br>8   | \$ \$      | A0.02                                    |                                                                                          |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 40.02                                                                                                                                        | ନ ଜୁ                                                                      | 40.02                                                                                                                     | 8 L :                                                                              | a a<br>3                                                                                                              | Nd S                                                            | 8 8 8<br>8 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | × 7 ·                                   | A A A                                                                         | Sm                        | 40.02                                                                                       | Tas                                    | 402            |   |        |               | 22-        |                                          |                                                                                          |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                              |                                                                           |                                                                                                                           |                                                                                    |                                                                                                                       |                                                                 | (T)=1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (T)= Target analyte                     | nalyte                                                                        |                           |                                                                                             |                                        |                |   |        |               |            |                                          |                                                                                          |
| Physical                                                                            | Physical Characterization:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | tion:                                                                                                                                        |                                                                           |                                                                                                                           |                                                                                    |                                                                                                                       |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                         |                                                                               |                           |                                                                                             |                                        |                |   |        | Certified by: | led by:    |                                          | a                                                                                        |
| Homogen                                                                             | Homogeneity: No heterogeneity was observed in the preparation of this standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | neity was o                                                                                                                                  | bserved                                                                   | l in the prepa                                                                                                            | ration c                                                                           | of this stands                                                                                                        | ard.                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                         |                                                                               |                           |                                                                                             |                                        |                |   |        | La la         | J.         |                                          | ľ                                                                                        |
| * The ce<br>* Purifiec<br>* All star<br>* Standa<br>* Standa<br>* All star<br>Measu | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | the conce<br>standard<br>rs are me<br>rs are me<br>ed gravim<br>d (+/-) 0.<br>d (+/-) 0.<br>ce stored<br>ce stored<br>se stored<br>" NIST Te | eionize<br>s.<br>s.<br>etriculou<br>etrical<br>with c<br>with c<br>chnica | on calculat<br>ed water, c<br>usly cleaned<br>ly using ba<br>the stated<br>aps tight <i>a</i><br>and Kuyat,<br>and Kuyat, | ed fro<br>alibrat<br>d prior<br>lances<br>1 value<br>C.E., 1<br>C.E., 1<br>C.E., 1 | ed Class <i>A</i><br>ed Class <i>A</i><br>to use.<br>that are i<br>that are i<br>that approp<br>Guidelines<br>Governm | A glass<br>A glass<br>calibra<br>therwia<br>s for En<br>hent Pr | ware and ware and ware and ware and with ware stated. Se stated aboratory valuating a valuating official section of the sectio | tric me<br>the hig<br>veights<br>ce, Wa | easuremer<br>yhest purit<br>s traceable<br>tions.<br>pressing t<br>ashington, | y raw<br>to NII<br>D.C. ( | ess otherwise stated.<br>materials are used in<br>ST (see above).<br>ST (see NIST<br>2994). | vise st<br>are us<br>bove).<br>of NIST | ated.<br>ed in |   |        |               |            |                                          |                                                                                          |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                              |                                                                           |                                                                                                                           |                                                                                    |                                                                                                                       |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                         |                                                                               |                           |                                                                                             |                                        |                |   |        |               |            |                                          |                                                                                          |
|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                              |                                                                           |                                                                                                                           |                                                                                    |                                                                                                                       |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                         |                                                                               |                           |                                                                                             |                                        |                |   |        |               |            |                                          |                                                                                          |

Part # 58024 Lot # 060523

| 0-368-1131<br>vw.absolutestandards. | r <b>ds, Inc.</b><br>.com                        | 5              |                                     |                    | (                    |                                   |                          | Material Cl              |                        |                            |                  | 🕨 🛛 🖌 🖡                                | AB ISO 17034<br>R-1539 Certifica<br>s://Absolutestan | te Nur      |
|-------------------------------------|--------------------------------------------------|----------------|-------------------------------------|--------------------|----------------------|-----------------------------------|--------------------------|--------------------------|------------------------|----------------------------|------------------|----------------------------------------|------------------------------------------------------|-------------|
|                                     | DRT:<br>Part Number<br>Lot Number<br>Description | T.             | <u>58029</u><br>102523<br>Copper (C | 211)               |                      |                                   | Lot #<br>24002546        | Solvent:<br>Nitric Acid  | , , ,                  | 1/20                       | in<br>Electro    | Ce_                                    |                                                      |             |
|                                     | xpiration Date                                   | :              | 102526<br>Ambient (20<br>1000       |                    |                      |                                   | 2.0%                     | 40.0<br>(mL)             | Nitric Acid            | Formulated B               | y:<br>1<br>1/0 7 | Benson Chan                            | 10252                                                | 23          |
| NIST                                | Test Number                                      |                | 6UTB                                | 2000.02            | 5E-05<br>0.058       | Balance Uncert<br>Flask Uncertain |                          |                          |                        | Reviewed By<br>Expanded    |                  | Pedro L. Rentas                        | 10252                                                | 23          |
| Compound                            |                                                  | Part<br>Number | Lot<br>Number                       | Dilution<br>Factor | Initial<br>Vol. (mL) | Uncertainty<br>Pipette (mL)       | Nominal<br>Conc. (µg/mL) | Initial<br>Conc. (µg/mL) | Final<br>Conc. (µg/mL) | Uncertainty<br>+/- (µg/mL) | (Solv<br>CAS#    | vent Safety Info. On<br>OSHA PEL (TWA) | Attached pg.)<br>LD50                                | NIST<br>SRM |
| Copper(II) nitrate trihydr          | rate (Cu)                                        | 58129          | 100223                              | 0.1000             | 200.0                | 0.084                             | 1000                     | 10000.1                  | 1000.0                 | 2.2                        | 10031-43-3       | 1 mg/m3                                | ori-rat 794 mg/kg                                    | 3114        |
| 1.0E6                               | [1] Spect                                        | trum N         | 0.1 [ 3                             | 33.422 s           | ec]:58(              | 029.D# [0                         | Count] [Li               | inear]                   |                        |                            |                  |                                        |                                                      |             |
| 5.0E5                               |                                                  |                |                                     |                    |                      |                                   |                          |                          |                        |                            |                  |                                        |                                                      |             |
| 5.0E5<br>m/z-><br>5.0E7             |                                                  | 0              | 20                                  | 30                 | <b>5</b> 8 8         | 40                                | 50                       | 60                       | 70                     | 5                          | e`o              | 90                                     | 100                                                  |             |
| m/z->                               | a                                                | D              | 20                                  | ad                 | <b>3</b>             | 40                                | 50                       | 60                       | 70                     | 5                          | BO               | 90                                     | 100                                                  |             |
| m/z-><br>5.0E7                      |                                                  | 10             | 20                                  | 30                 |                      | 40                                | 50                       | 60                       |                        |                            | 80               |                                        | 100                                                  |             |
| m/z-><br>5.0E7<br>2.5E7             |                                                  |                |                                     |                    |                      |                                   |                          |                          |                        |                            |                  |                                        |                                                      |             |
| m/z-><br>5.0E7<br>2.5E7<br>m/z->    |                                                  |                |                                     |                    |                      |                                   |                          |                          |                        |                            |                  |                                        |                                                      |             |





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### Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|    | Contraction of the local division of the loc | 0.204 |       |    |       |    | Trace M | etals | S Verifica | ition | by ICP-M | is (µ | g/mL) |    |       |    |       |     |       |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|----|-------|----|---------|-------|------------|-------|----------|-------|-------|----|-------|----|-------|-----|-------|
| Al | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Cd    | <0.02 | Dy | <0.02 | Hf | <0.02   | Li    | <0.02      | Ni    | <0.02    | Pr    | <0.02 | Se | <0.2  | Tb | <0.02 | l w | <0.02 |
| Sb | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Ca    | <0.2  | Er | <0.02 | Ho | <0.02   | Lu    | <0.02      | Nb    | <0.02    | Re    | <0.02 | Si | <0.02 | Te | <0.02 | U U | <0.02 |
| As | <0.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Ce    | <0.02 | Eu | <0.02 | In | <0.02   | Mg    | <0.01      | Os    | <0.02    | Rh    | <0.02 | Ag | <0.02 | п  | <0.02 | v   | <0.02 |
| Ba | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Cs    | <0.02 | Gd | <0.02 | Ir | <0.02   | Mn    | <0.02      | Pd    | <0.02    | Rb    | <0.02 | Na | <0.2  | Th | <0.02 | Yb  | <0.02 |
| Be | <0.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Cr    | <0.02 | Ga | <0.02 | Fe | <0.2    | Hg    | <0.2       | P     | <0.02    | Ru    | <0.02 | Sr | <0.02 | Tm | <0.02 | Y   | <0.02 |
| Bi | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Co    | <0.02 | Ge | <0.02 | La | ⊲0.02   | Mo    | <0.02      | Pt    | <0.02    | Sm    | <0.02 | S  | <0.02 | Sn | <0.02 | Zn  | <0.02 |
| B  | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Cu    | Т     | Au | <0.02 | Pb | <0.02   | Nd    | <0.02      | K     | <0.2     | Sc    | <0.02 | Ta | <0.02 | Ti | <0.02 | Zr  | <0.02 |

(T) = Target analyte

### **Physical Characterization:**

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Bar ? Ma

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

- \* All standard containers are meticulously cleaned prior to use.
- \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All Standards should be stored with caps tight and under appropriate laboratory conditions.
- \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com      |                           | Certified Reference                                                                 | Material CRM             |                       | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Numbe<br>https://Absolutestandards.com |
|----------------------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------|--------------------------|-----------------------|-----------------------------------------------------------------------------------------|
| CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Description:    | 102623                    | Lot #<br>24002546                                                                   | Solvent:<br>Nitric Acid  | 1 Engl                |                                                                                         |
| Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): | 102626<br>Ambient (20 °C) | 2.0%                                                                                | 60.0 Nitric Acid<br>(mL) | 1 4                   | nson Chan 102623                                                                        |
| NIST Test Number:<br>Volume shown below w                                  | 6UTB                      | 5E-05 Balance Uncertainty<br>0.058 Flask Uncertainty<br>Initial Uncertainty Nominal | Initial Final            | Expanded              | Gro L. Rentas 102623<br>SDS Information<br>Gafety Info. On Attached pg.) NIST           |
| Compound                                                                   | Number Number Factor      | Vol. (mL) Pipette (mL) Conc. (µg/mL)                                                |                          |                       | HA PEL (TWA) LD50 SRM                                                                   |
| 1. Manganese(II) nitrate tetrahydrate (Mn)                                 | 58125 071123 0.1000       | 300.0 0.084 1000                                                                    | 10000.1 <b>1000.0</b>    | <b>2.1</b> 20694-39-7 | 5 mg/m3 orl-rat >300mg/kg 3132                                                          |
| [1] Spectru<br>5.0E6                                                       | um No.1 [34.243 s         | ec]:57025.D# [Count] [Li                                                            | near]                    |                       |                                                                                         |
| 2.5E6                                                                      |                           |                                                                                     |                          |                       |                                                                                         |
| m/z-> 10                                                                   | 20 30                     | 40 50                                                                               | 60 70                    | o so so so            | 0 100                                                                                   |
| 1.0E8                                                                      |                           |                                                                                     |                          |                       |                                                                                         |
| 5.0E7                                                                      |                           |                                                                                     |                          |                       |                                                                                         |
| m/z-> 110                                                                  | 120 130                   | 0 140 150                                                                           | 160 17                   | 0 180 16              | 00 200                                                                                  |
| 1.OE8                                                                      |                           |                                                                                     |                          |                       |                                                                                         |
| 5.0E7                                                                      |                           |                                                                                     |                          |                       |                                                                                         |
| m/z-> 210                                                                  | 220 230                   | 240 250                                                                             | 260                      |                       |                                                                                         |





ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

### Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|    |       |    |       |    |       |      | Trace M | etals | Verifica | tion | by ICP-M | IS (µ | g/mL) |    |       |    |       |    |       |
|----|-------|----|-------|----|-------|------|---------|-------|----------|------|----------|-------|-------|----|-------|----|-------|----|-------|
| AI | <0.02 | Cd | <0.02 | Dy | <0.02 | Hf   | <0.02   | Li    | <0.02    | Ni   | <0.02    | Pr    | <0.02 | Se | <0.2  | Тъ | <0.02 | W  | <0.02 |
| Sb | ⊲0.02 | Ca | <0.2  | Er | <0.02 | Ho   | <0.02   | Lu    | <0.02    | Nb   | <0.02    | Re    | <0.02 | Si | <0.02 | Te | <0.02 | U  | <0.02 |
| As | <0.2  | Ce | <0.02 | Eu | <0.02 | In   | <0.02   | Mg    | <0.01    | Os   | <0.02    | Rh    | <0.02 | Ag | <0.02 | П  | <0.02 | v  | <0.02 |
| Ba | <0.02 | Cs | <0.02 | Gd | <0.02 | lr I | <0.02   | Mn    | Т        | Pd   | <0.02    | Rb    | <0.02 | Na | ⊲0.2  | Th | <0.02 | Yb | <0.02 |
| Be | ⊲0.01 | Cr | <0.02 | Ga | <0.02 | Fe   | <0.2    | Hg    | <0.2     | P    | <0.02    | Ru    | <0.02 | Sr | <0.02 | Tm | <0.02 | Y  | <0.02 |
| Bi | <0.02 | Co | <0.02 | Ge | <0.02 | La   | <0.02   | Mo    | <0.02    | Pt   | <0.02    | Sm    | <0.02 | S  | <0.02 | Sn | <0.02 | Zn | <0.02 |
| B  | <0.02 | Cu | <0.02 | Au | <0.02 | Pb   | <0.02   | Nd    | <0.02    | K    | <0.2     | Sc    | <0.02 | Ta | <0.02 | Ti | <0.02 | Zr | <0.02 |

(T) = Target analyte

### **Physical Characterization:**

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Ben P. M

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the balances that are calibrated with weights traceable to NIST (see above).

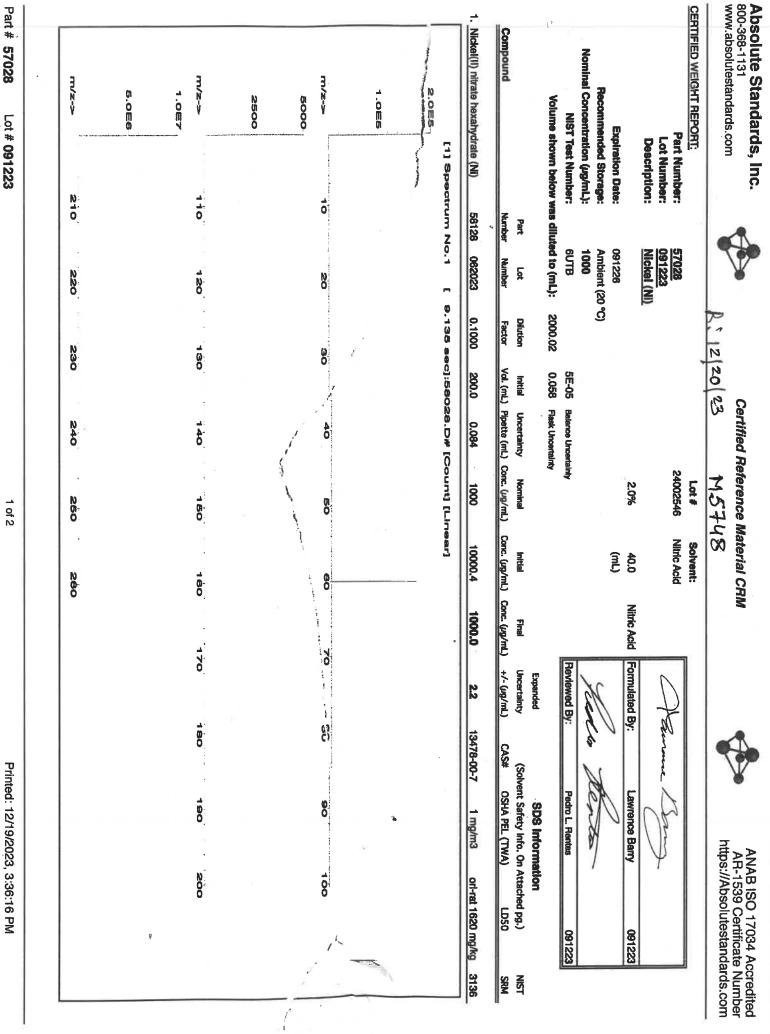
\* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All standards should be stored with caps tight and under appropriate laboratory conditions.

\* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

| m/z->               |  | 2.0E6 | m/z->       | 0.0<br>П<br>14 | A<br>)<br>] | 1.0E5 | m/z->    | 0,<br>0<br>11<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12<br>12 | 1.005                                 | 1. Lead(II) nitrate (Pb)     | Compound                                                                                        | Weight sho                     | NIST 1                       | Recommended Storage:<br>Nominal Concentration (µg/mL): | Exc                           |                                              | CERTIFIED WEIGHT REPORT: | ADSOIUTE Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|---------------------|--|-------|-------------|----------------|-------------|-------|----------|---------------------------------------------------------------------------------------|---------------------------------------|------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------|------------------------------|--------------------------------------------------------|-------------------------------|----------------------------------------------|--------------------------|------------------------------------------------------------------------------------------|
| 21<br>0<br>220<br>0 |  |       | 110 120     |                |             |       | 10 20    |                                                                                       | [1] Spectrum No.1 [ 14                | IN029 PBD122016A1            | Lot M<br>RM# Number Conc                                                                        | s diluted to (mL):             | NIST Test Number: 6UTB       |                                                        | Expiration Date: 100926       | Lot Number: 100923<br>Description: Lead (Pb) |                          | om                                                                                       |
| 230                 |  |       | 130 140     |                |             |       | 30 40    |                                                                                       | 14.144 sec]:58082.D# [Count] [Linear] | 1000 93.999 0.10 62.5        | Nominal Purity Uncertainty Assay<br>Conc. (µg/mL) (%) Purity (%) (%) V                          | 3000.41 0.06 Flask Uncertainty | 5E-05 Balance Uncertainty    |                                                        | 2%                            |                                              |                          | Certified Referenc                                                                       |
| 250                 |  |       | 150 180 170 |                |             |       | 50 60 70 |                                                                                       | tj [Linear]                           | 4.80071 4.80077 1000.0       | Target Actual Actual<br>Weight (g) Weight (g) Conc. (µg/mL)                                     |                                |                              | (111)                                                  | 60.0 Nitric Acid              | 46 NITHC ACID                                |                          | Certified Reference Material CRM<br>ションンクロン MSチムチ                                        |
|                     |  |       | 0 180 190   |                |             |       | 8.<br>0  |                                                                                       |                                       | 2.0 10099-74-8 0.05 mg/m3    | Expanded SDS Informa<br>Uncertainty (Solvent Safety Info. On<br>+/- (µg/mL) CAS# OSHA PEL (TWA) |                                | Reviewed By: Pedro L. Rentas | Keller Hen                                             | Formulated By: Lawrence Barry | Admone By                                    |                          | *                                                                                        |
|                     |  |       | 2000        |                |             |       | 100      |                                                                                       |                                       | m3 intrvns-rat 83 mg/kg 3128 | SDS Information<br>(Solvent Safety Info. On Attached pg.) NIST<br># OSHA PEL (TWA) LD50 SRM     |                                | tas 100923                   | Ø                                                      | ny 100923                     | \¥                                           |                          | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

|                                                                                                                                                                                                             | DEFF12: 10205000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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                          |                                                                                                 |                                                    |                                                                               |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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                                                                                                                                                                                                                                               | 00923                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Lot # 100923                                                                             |                                                                                                          | Part # 57082                                 |
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(1994). | ity raw<br>the to Ni<br>the Unc. ( | The certified value is the concentration calculated from gravimetric and volumetric measurements<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable t<br>Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.<br>All Standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D | netric<br>d the<br>d.<br>g and I<br>g ffice, V | and volur<br>assware ar<br>vrated with<br>wise state<br>te laborate<br>Printing C<br>Printing C | s A gli<br>re califi<br>ropria<br>nes foi<br>nment | or to use.<br>S. 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Gover                                            | ated f<br>calibr<br>valance<br>t and c<br>t, C.E.<br>297, U | tion calcu<br>ed water<br>usly clear<br>ally using<br>f the stat<br>and Kuya<br>al Note 1;<br>al Note 1;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | sentrat<br>deioniz<br>deioniz<br>deioniz<br>deioniz<br>echnic<br>c, B.N.<br>h<br>S.% o<br>c, B.N.<br>h<br>i. 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S.% o<br>c, B.N.h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h<br>h | The certified value is the concentration calculated from gravimetric and volume<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with w<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All Standards should be stored with caps tight and under appropriate laboratory<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating a<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Offi | value i<br>ion of a<br>contain<br>e prepa<br>e certif<br>keferen<br>t Result<br>t Result | certified<br>preparat<br>landard a<br>dards ar<br>dards ar<br>tandards<br>tandards<br>suremen<br>suremen | * The<br>* Purifi<br>* Stan<br>* Stan<br>Mea |
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          | umental                                                                                                  | Instru                                       |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                                                                                                                                                                                               | s, Inc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ards.co                                                                                  | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                                    | w.absol                                      |



| Part # 57028 Lot # 091223 2 of 2 |       | <ul> <li>* Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in<br/>the preparation of all standards.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All Standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of<br/>NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).</li> </ul> | Homogeneity: No heterogeneity was observed in the preparation of this standard. | (T) = Target aria/vie | AI         A02         Cd         A02         Dy         A02         H         A02         N         T         Pr         A02         S         A02         C4         A02         E         A02         H         A02         Li         A02         N         T         Pr         A02         S         A02         C4         A02         E         A02         H         A02         Li         A02         N         T         Pr         A02         S         A02         C4         A02         E         A02         H         A02         Li         A02         N         A02         N <t< th=""><th>Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):<br/>Trace Metals Verification by ICP-MS (µg/mL)</th><th>www.absolutestandards.com</th></t<> | Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):<br>Trace Metals Verification by ICP-MS (µg/mL) | www.absolutestandards.com                                   |
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|                                  | 5<br> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | P. S.                                                                           | Certified by:         | W         -0.02           U         -0.02           V         -0.02           Yb         -0.02           Yb         -0.02           Yb         -0.02           Zn         -0.02           Zr         -0.02           Zr         -0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                | AR-1539 Certificate Number<br>https://Absolutestandards.com |

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| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                                                                                                                                              | M                                         | M5768 [M5769 (64)<br>Certified Reference Material   | ce Material CRM                                             | 42/s                                       | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------|
| CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Description:                                                                                                                                            | <u>58112</u><br>091823<br>Magneslum (Mg)  | Solvent: 24                                         | Lot #<br>24002546 Nitric Acid                               | Advenue                                    | Or -                                                                                        |
| Expiration Date:       091826         Recommended Storage:       Ambient (         Nominal Concentration (µg/mL):       10000         NIST Test Number:       6UTB         Weight shown below was diluted to (mL): | 20 °C)                                    |                                                     | (mL)<br>(mL)<br>$(BF)$ $R - \frac{1}{3}/2\phi$              | Formulated By:<br>Heviewed By:             | Lawrence Barry 091823<br>Pedro L. Rentas 091823                                             |
| Compound                                                                                                                                                                                                           | Lot Nominal I<br>RM# Number Conc. (µg/mL) | Purity Uncertainty Assay T<br>(%) Purity (%) (%) We | Target Actual Actual<br>Weight (g) Weight (g) Conc. (vg/mL) | Expanded<br>Uncertainty<br>+/- (µg/mL) CAS | SDS Information<br>(Solvent Safety Info. On Attached pg.) NIST<br># OSHA PEL (TWA) LDSO SRM |
| 1. Magnesium nitrate hexahydrate (Mg) IN030 маюзаал                                                                                                                                                                | 10000                                     | 99.999 0.10 8.51 23                                 |                                                             | 20.0 13446-1                               | ng/kg 3                                                                                     |
| [1] Spectrum No.1<br>1.0E6                                                                                                                                                                                         |                                           | [ 19.923 sec]:58112.D# [Count] [Linear]             | [Linear]                                                    |                                            |                                                                                             |
| 5.<br>0 M<br>6<br>7                                                                                                                                                                                                |                                           |                                                     |                                                             |                                            |                                                                                             |
| m/z-> 10                                                                                                                                                                                                           | 20                                        | 8                                                   | ø                                                           | 70 80                                      | 90 100                                                                                      |
| 1000 -                                                                                                                                                                                                             |                                           | ·                                                   |                                                             | 4                                          |                                                                                             |
| ₩/z->                                                                                                                                                                                                              | 120 130                                   | 140                                                 | 150 160                                                     | 170 180 1                                  | 190                                                                                         |
| 1.0<br>1.0<br>1.0<br>1.0<br>1.0<br>1.0<br>1.0<br>1.0                                                                                                                                                               |                                           |                                                     |                                                             |                                            |                                                                                             |
| Part # 58112 Lot # 091823                                                                                                                                                                                          |                                           | -                                                   | 1 of 2                                                      | Drintod                                    | Drintod- 10/00/0000 0.56-15 DM                                                              |

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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

| Γ        |       |   |              |    |       |    | Trace Mo | etals | Verifica         | tion | by ICP-N | IS (µ | g/mL) |     |                   |     |       |    |       |
|----------|-------|---|--------------|----|-------|----|----------|-------|------------------|------|----------|-------|-------|-----|-------------------|-----|-------|----|-------|
|          |       |   |              |    |       |    |          |       | 1100 100 100 100 |      |          |       |       | 100 | The second second |     |       |    |       |
| A        | <0.02 | 8 | <0.02        | Dy | <0.02 | Hf | <0.02    | 5     | <0.02            | Ni   | <0.02    | Ŗ     | <0.02 | Se  | 40.2              | qI. | <0.02 | W  | <0.02 |
| SP       | <0.02 | G | <0.2         | E. | <0.02 | Ho | <0.02    | Lu    | <0.02            | Nb   | <0.02    | Re    | <0.02 | ŝ   | <0.02             | Te  | <0.02 | d  | <0.02 |
| As       | <0.2  | ĉ | <0.02        | E  | <0.02 | In | <0.02    | Mg    | ]                | SO   | <0.02    | Rh    | <0.02 | Ag  | <0.02             | H   | <0.02 | V  | 40.02 |
| Ba       | <0.02 | S | <0.02        | ନୁ | <0.02 | F  | <0.02    | Mn    | <0.02            | Pd   | <0.02    | Rb    | <0.02 | Na  | <0.2              | Ъ   | <0.02 | Υb | <0.02 |
| Ве       | <0.01 | Ŷ | <0.02        | Ga | <0.02 | Fe | 40.2     | Hg    | <0.2             | ٩    | <0.02    | Ru    | <0.02 | Sr  | <0.02             | Tm  | <0.02 | ĸ  | <0.02 |
| B        | <0.02 | S | <0.02        | Ģ  | <0.02 | La | <0.02    | Mo    | <0.02            | Ŗ    | <0.02    | Sm    | <0.02 | cn  | <0.02             | Sn  | <0.02 | 6  | <0.02 |
| <b>5</b> | 40.02 | ç | <b>40.02</b> | Au | <0.02 | P  | <0.02    | Nd    | <0.02            | ĸ    | <0.2     | S.    | <0.02 | Ta  | <0.02             | Ti  | <0.02 | Zr | <0.02 |

(T) = Target analyte

**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.

\* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions.

\* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58112 Lot # 091823



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|    |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |       |    | Trace M | letals                                      | Verification | Ition                                                                                                          | by ICP-MS                                                                                                       |            | (ng/mL) |    |                              |         |              |    |                                                                                                                | _  |
|----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------|----|---------|---------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------|---------|----|------------------------------|---------|--------------|----|----------------------------------------------------------------------------------------------------------------|----|
|    |       | and the second se | A CONTRACTOR OF A CONTRACTOR |    |       |    |         | All and | The share of | The second s | ALL DESCRIPTION OF THE OWNER OF T | Nonese and |         |    | and the second second second |         |              |    | A CONTRACTOR OF A CONTRACT | 10 |
| A  | <0.02 | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | à  | <0.02 | Hf | <0.02   | ГI                                          | <0.02        | N                                                                                                              | <0.02                                                                                                           | Ł          | <0.02   | Se | <0.2                         | Trb     | <0.02        | M  | <0.02                                                                                                          | -  |
| Sb | <0.02 | J                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 40.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 固  | <0.02 | Ho | ≤0.02   | 2                                           | <0.02        | £                                                                                                              | <0.02                                                                                                           | Re         | <0.02   | S  | <0.02                        | Pe<br>L | <b>40.02</b> | D  | <0.02                                                                                                          | _  |
| As | <02   | ඊ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Eu | 40.02 | ч  | 40.02   | Mg                                          | 10.0>        | ő                                                                                                              | <0.02                                                                                                           | Rh         | <0.02   | Ag | <0.02                        | F       | ≤0.02        | >  | <0.02                                                                                                          | -  |
| Ba | <0.02 | ű                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3  | 40.02 | Ц  | <0.02   | Mn                                          | <0.02        | P                                                                                                              | ≤0.02                                                                                                           | £          | <0.02   | Ra | <b>40</b> 12                 | đ       | <0.02        | \$ | <0.02                                                                                                          | -  |
| Be | T     | Ċ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | G  | <0.02 | e. | <02     | Hg                                          | <02          | ۵.                                                                                                             | <0.02                                                                                                           | Ru         | ≤0.02   | 2  | <0.02                        | μ       | <0.02        | 7  | <0.02                                                                                                          | -  |
| Ä  | <0.02 | රී                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <0.0≥                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | පී | <0.02 | r. | <0.02   | Mo                                          | <0.02        | đ,                                                                                                             | <b>40.02</b>                                                                                                    | Sm         | ≤0.02   | s  | <0.02                        | Sn      | <0.02        | Za | <0.02                                                                                                          | -  |
| æ  | <0.02 | ð                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Au | <0.02 | £  | 40.02   | PN                                          | <0.02        | М                                                                                                              | <0.2                                                                                                            | ŝ          | <0.02   | Ta | <0.02                        | F       | <0.02        | 2  | 40.02                                                                                                          | _  |
|    |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |       |    |         |                                             | (T) = Tarr   | get analy                                                                                                      | yte                                                                                                             |            |         |    |                              |         |              |    |                                                                                                                | 1  |
|    |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |       |    |         |                                             |              |                                                                                                                |                                                                                                                 |            |         |    |                              |         |              |    |                                                                                                                |    |

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

**Certified by:** 

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

- \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
  - All standard containers are meticulously cleaned prior to use.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
  - Standards are certifed ( $\frac{1}{4}$ ) 0.5% of the stated value, unless otherwise stated.
- All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

| Part # 57050 Lot # | m/z->      | N.01<br>M.4 | m/2->-  | 1.0E5 | 177/2-><br>2.0E5 | N<br>G<br>M<br>G | 8.<br>0<br>11<br>15                   | 1. Ammonium hexatluorostannate(IV) (Sn) | Compound                                                                                   | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (ug/mL):<br>NIST Test Number:<br>Weight shown below w                                             | <u>CERTIFIED WEIGHT REPORT</u><br>Part N<br>Lot N<br>Desc                                              | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|--------------------|------------|-------------|---------|-------|------------------|------------------|---------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Lot # 071123       | 210        |             | 110 120 |       | 0<br>No          |                  | [1] Spectrum No.1                     | (W) (Sn) INO10 SND042023A1              | Lot<br>RM# Number                                                                          | Expiration Date: 071126<br>Pecommended Storage: Ambient (20 °C)<br>Concentration (µg/mL): 1000<br>NIST Test Number: 6UTB<br>Weight shown below was diluted to (mL): | <u>PORT:</u><br>Part Number: <u>57050</u><br>Lot Number: <u>071123</u><br>Description: <u>Tin (Sn)</u> | s.com                                                                                    |
|                    | 230        |             | 130     |       | e<br>e           |                  | [ 15.034 sec]:                        | 1000                                    | Nominal<br>Conc. (µg/mL)                                                                   | 0 °C)<br>499.93                                                                                                                                                     | 2                                                                                                      | V                                                                                        |
|                    | 20         |             | 140     |       | ð                |                  | 15.034 sec]:58150.D# [Count] [Linear] | 99.999 0.10 44.2                        | Purity Uncertainty Assay<br>(%) Purity (%) (%)                                             | 5E-05 Balance Uncertainty<br>0.058 Flask Uncertainty                                                                                                                | Solvents:                                                                                              | Certific                                                                                 |
|                    | N30<br>260 |             | 150 160 |       | 8                |                  | unt) [Linear]                         | 1.13107                                 | r Target Actual<br>Weight (g) Weight (g)                                                   | (mL)                                                                                                                                                                | Lot #<br>21110221<br>22D0562008                                                                        | Certified Reference Material                                                             |
|                    |            |             | 170     |       | 70               |                  |                                       | 1001.6                                  | Actual<br>Conc. (µg/mL)                                                                    | ric acid                                                                                                                                                            | ric acid                                                                                               | CRM                                                                                      |
|                    |            |             | 180     |       | 80               |                  |                                       | 16919-                                  | Expanded<br>Uncertainty (Solv<br>+/- (µg/mL) CAS#                                          | Formulated By:                                                                                                                                                      |                                                                                                        | PPGP M                                                                                   |
|                    |            |             | 190 200 |       | 90 100           |                  |                                       | 7 mg/m3                                 | <b>SDS Information</b><br>(Solvent Safety Info. On Attached pg.)<br>)# OSHA PEL (TWA) LD50 | Benson Chan                                                                                                                                                         |                                                                                                        | R                                                                                        |
|                    |            |             | 0       |       | ŏ                |                  |                                       | ω                                       | on<br>tached pg.) NIST<br>LD50 SRM                                                         | 071123<br>-<br>071123                                                                                                                                               |                                                                                                        | ANAB ISC<br>AR-1539 (<br>https://Abso                                                    |
|                    |            |             |         |       |                  |                  |                                       |                                         |                                                                                            |                                                                                                                                                                     |                                                                                                        | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                                                                                                                                                                                                                                                                                                                                                                                                                                         | •                                                                        | Cei                                                         | Certified Reference Material CRM                    | ial CRM                                                           |                           | ANAB ISO 17034 Accredited                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------|---------------------------|-------------------------------------------------------------|
| www.absolutestandards.com                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5                                                                        |                                                             |                                                     |                                                                   | <b>V</b>                  | AR-1539 Certificate Number<br>https://Absolutestandards.com |
| Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):                                                                                                                                                                                                                                                                                                                                                                                                                               | ductively Coupled                                                        | Plasma Mass Spec                                            | trometry (ICP-MS):                                  |                                                                   |                           |                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                          | Trace Metals                                                | Is Verification by ICP-MS                           | P-MS (µg/mL)                                                      |                           |                                                             |
| AI <0.02 Cd <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Dy <0.02                                                                 | 4003                                                        |                                                     |                                                                   |                           |                                                             |
| A)2<br>C<br>C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                          | 2 2 2<br>2 2 2 2                                            | 40.02 Ni                                            |                                                                   | Se <0.2 Tb<br>Si <0.02 Te | 40.02 W 40.02                                               |
| 2 2 2 2<br>2 2 2 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                          |                                                             | <0.01 Os<br><0.02 Pd                                | Rb<br>Rb                                                          |                           | \$ < c                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Ge 40.02                                                                 | Fe 40.2 Hg                                                  | 40.2 P<br>40.02 Pt                                  | Ru<br>Sm                                                          |                           | _                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                          |                                                             | (T) = Target                                        | 4                                                                 | ZITAS                     | <0.02 Zr <0.02                                              |
| Physical Characterization:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                          |                                                             |                                                     |                                                                   |                           | Certified by:                                               |
| Homogeneity: No heterogeneity was observed in the preparation of this standard.                                                                                                                                                                                                                                                                                                                                                                                                                               | observed in the prepa                                                    | ration of this standard.                                    |                                                     |                                                                   |                           | //                                                          |
| ŝ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 9                                                                        |                                                             |                                                     |                                                                   |                           | mr P All                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                          |                                                             |                                                     |                                                                   |                           |                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                          | 9<br>4                                                      |                                                     |                                                                   | 20                        |                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                          |                                                             |                                                     |                                                                   | ÷                         |                                                             |
| <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are politoriated with using balances.</li> </ul> | centration calculat<br>deionized water, ca<br>ds.<br>eticulously cleaned | d from gravimetric<br>librated Class A gla<br>prior to use. | and volumetric measurer<br>ssware and the highest p | nents unless otherwise stated.<br>writy raw materials are used in | ie stated.<br>'e used in  |                                                             |

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
 All standards should be stored with caps tight and under appropriate laboratory conditions.
 Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 57050 Lot # 071123

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| redited<br>Jumber<br>ds.com                                                              | NIST<br>SRM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3113                                      |                                                                                 |                                      |
|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------|
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | Formulated By: Lawrence Barry 091923<br>Formulated By: Lawrence Barry 091923<br>Reviewed By: Pedro L. Rentas 091923<br>Expanded SDS Information<br>Uncertainty (Solvent Safety Info. On Attached pg.) N<br>+/- (ug/mL) CAS# 0SHA PEL (TWA) LD50 S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ng/kg                                     | 180 B0<br>190 200<br>200 200                                                    | Printed: 2/8/2024, 5:01:14 PM        |
| AM<br>I'U ( fru (                                                                        | Nitric Acid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1000.0                                    |                                                                                 |                                      |
| Certified Reference Material CRM $02109124$                                              | Solvent:<br>Nttric Acid<br>40.0<br>(mL)<br>httal<br>bittal<br>Conc. (ug/mL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10000.0                                   |                                                                                 |                                      |
| artified Réference l<br>0 Z   0 9 1 2 4                                                  | Lot # C<br>24002546<br>2.0%<br>2.0%<br>Nominat<br>Nominat<br>Conc. (rg/mL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1000                                      | 34.243 eec]:58027.D# [Count] [Linear]<br>30 40 50<br>130 140 150<br>230 240 250 | 1 of 2                               |
| Certified F                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.084                                     | 240<br>240<br>240                                                               |                                      |
| Å                                                                                        | 5E-05<br>0.058<br>on Initial<br>or Vol. (mL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00 200.0                                  | 3 eec]:55<br>230 30<br>23 130                                                   |                                      |
|                                                                                          | 57027<br>091923<br>Cobait (Co)<br>091926<br>Ambient (20 °C)<br>1000<br>6UTB<br>6UTB<br>6UTB<br>d to (mL): 2000.02<br>Lot Dilution<br>Lot Dilution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 23 0.1000                                 |                                                                                 |                                      |
|                                                                                          | 57027<br>091923<br>Cobalt (<br>Cobalt (<br>Ambient<br>Ambient<br>1000<br>6UTB<br>ss diluted to (mL<br>Part Lot                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 58127 050923                              |                                                                                 |                                      |
| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    | CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Description:<br>Cobait (C<br>Cobait (C<br>Cobait (C<br>091926<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>Nominal Concentration (µg/mL):<br>Nominal Concentration (µg/mL):<br>COTB<br>NIST Test Number:<br>COTB<br>CODAIT (C)<br>Part (C)<br>CODAIT (C)<br>C)<br>CODAIT (C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C) | 1. Cobatt(II) nitrate hexahydrate (Co) 58 |                                                                                 | <pre>Part # 57027 Lot # 091923</pre> |

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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);

| L | 200   | 10 | 2 Contraction | 4  | 2000          |    | 400         |    |                   | -  |              | 4  |              |    |              |    |       |    |              |
|---|-------|----|---------------|----|---------------|----|-------------|----|-------------------|----|--------------|----|--------------|----|--------------|----|-------|----|--------------|
| _ | 20.05 | 3  | 20.02         | 5  | 20.02         | Ħ  | 40.02       | 3  | <0.02             | ż  | 40.02        | £  | 40.02        | 8  | 40.2         | f  | ₫.02  | M  | <b>40.02</b> |
| _ | 40.02 | లి | <b>4</b> 02   | 山  | €0.02         | Ho | 40.02       | 5  | <0.02             | Ż  | <u>40.02</u> | Re | <0.02        | 3  | ≤0.02        | Te | €0.02 | D  | <0.02        |
| _ | 402   | ථ  | €0.05         | 圕  | 40.02         | Ч  | 40'02       | Mg | 10 <sup>0</sup> ⊳ | ő  | ≤0.02        | 붭  | <0.02        | Ag | <b>40.02</b> | F  | <0.02 | Ż  | <0.02        |
| _ | 40.02 | లి | ≤0.02         | ઝ  | <b>600</b>    | ы  | <0.02       | Mn | <0.02             | P  | 40,02        | ßb | <0.02        | Na | 40.2         | đ  | <0.02 | Ŗ  | <0.02        |
| _ | 10.05 | ບັ | ≤0.02         | g  | <b>20.0</b> 2 | ङ  | 402         | Hg | 40.2              | ۵. | €0.02        | Ru | <0.02        | ي. | ≪0.02        | Ta | ≤0.02 | Y  | €0.02        |
| _ | <0.02 | ථ  | £-            | ö  | 40.02         | Ľ  | <b>0</b> 02 | Mo | <u>60.02</u>      | æ, | <0.02        | Sm | <0.02        | S  | <0.02        | Sn | <0.02 | 2  | <b>6</b> .02 |
| _ | 40.02 | ට් | <0.02         | Au | <b>40.02</b>  | £  | 40.02       | PN | 40.02             | м  | <b>4</b> 02  | 8  | <b>40.02</b> | £  | 40.02        | Ë  | 40.02 | 72 | 2002         |

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in

the preparation of all standards.

All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Certified by:

| Printed: 2/8/2024, 5:01:04 PM                                                                                                                                 | 1 of 2                                | Part # 57033 Lot # 111323                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------|
| ő                                                                                                                                                             | 230 240 250 26                        | m/z-> 210 220 2                                                       |
|                                                                                                                                                               |                                       | G<br>O<br>O                                                           |
| 160 170 180 190 200                                                                                                                                           | 130 140 150 1                         | m/≥-> 110 120 1                                                       |
|                                                                                                                                                               |                                       | N<br>m<br>4                                                           |
| 80 70 80 100                                                                                                                                                  | 90<br>40<br>50                        | 5.0E4                                                                 |
|                                                                                                                                                               |                                       | - 1<br>.0<br>m<br>B                                                   |
|                                                                                                                                                               | 34.433 sec]:57033.D# [Count] [Linear] | [1] Spectrum No.1 [ 34.433<br>2.0E5                                   |
| 1000.0 2.0 7440-38-2 0.5 mg/m3 orl-rat                                                                                                                        | 400.0 0.084 1000                      | 1. Arsenic (As) 58133 020522 0.1000                                   |
| Expanded <b>SDS Information</b><br>Final Uncertainty (Solvent Safety Info. On Attached pg.)<br><u>nL) Conc. (ug/mL) +/- (ug/mL) CAS</u> # OSHA PEL (TWA) LD50 | 11                                    | Part Lot Dilution<br>Compound Number Number Factor                    |
| Reviewed By: Pedro L. Rentas 111323                                                                                                                           | 0.06 Flask Uncertainty                | Volume shown below was diluted to (mL): 4000.0                        |
| Hedre Fenter                                                                                                                                                  |                                       |                                                                       |
| Id Acid Formulated By: Lawrence Barry 111992                                                                                                                  | 24002546 Nitric Acid<br>2.0% 80.0     | Description: <u>Arsenic (As)</u>                                      |
| п<br>(                                                                                                                                                        | Lot <b>#</b> Solvent:                 |                                                                       |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com                                                                      | Certified Reference Material CRM      | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com |

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**Certified Reference Material CRM** 



https://Absolutestandards.com ANAB ISO 17034 Accredited **AR-1539** Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

(T) = Target analyte

Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Low P. S.

**Certified by:** 

 \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
 \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

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\* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All standards should be stored with caps tight and under appropriate laboratory conditions.
 \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST
 \* Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 57033 Lot # 111323

| N<br>O<br>N<br>O<br>O                                                                                                                                                                                                                          |                                                                      |                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------|
|                                                                                                                                                                                                                                                | 220 230 240 21                                                       | m/z-> 210                                                             |
|                                                                                                                                                                                                                                                |                                                                      | א.<br>50<br>ס                                                         |
|                                                                                                                                                                                                                                                |                                                                      | 5.068                                                                 |
| 150 160 170 180 190 200                                                                                                                                                                                                                        | 120 130 140 18                                                       | m/z-> 110                                                             |
|                                                                                                                                                                                                                                                |                                                                      | N<br>07<br>00                                                         |
|                                                                                                                                                                                                                                                |                                                                      | 5. OE6                                                                |
| 50 70 80 100                                                                                                                                                                                                                                   | Ю<br>О<br>О                                                          | m/z->                                                                 |
|                                                                                                                                                                                                                                                |                                                                      | 1.0臣4                                                                 |
| [Linear]                                                                                                                                                                                                                                       | 4o.1 [ 12.275 sec]:58105.D# [Count] [Linear]                         | [1] Spectrum No.1<br>2.0E4                                            |
| 11.55772 11.56201 1000.4 2.0 10043-35-3 2 mg/m3 orl-rat 2660 mg/kg                                                                                                                                                                             | IN018 BV082016A1 1000 99.9988 0.10 17.3 11.5                         | 1. Boric acid (B) IN018 E                                             |
| Expanded       SDS Information         Target       Actual       Uncertainty       (Solvent Safety Info. On Attached pg.)         Weight (g)       Weight (g)       Conc. (µg/mL)       +/- (µg/mL)       CAS#       OSHA PEL (TWA)       LD50 | Nominal Purity Uncertainty Assay<br>Conc. (µg/mL) (%) Purity (%) (%) | Compound RM#                                                          |
|                                                                                                                                                                                                                                                | 1000 4R                                                              |                                                                       |
| Reviewed By: Pedro L. Rentas 071123                                                                                                                                                                                                            | 6UTB 5E-05 Balance Uncertainty                                       | Nominal Concentration (µg/mL): 1<br>NIST Test Number: 6               |
| 40.0 Ammonium hydroxide Formulated By: Benson Chan 071123                                                                                                                                                                                      | ( <b>B</b> )<br>2.0%                                                 |                                                                       |
| Solvent: MKBC8597V Ammonium hydroxide                                                                                                                                                                                                          | 57005 Lo<br>071123                                                   | CERTIFIED WEIGHT REPORT:<br>Part Number: 5                            |
| ce Material CRM       ANAB ISO 17034 Accredited         M 5종14       주가 5종14                                                                                                                                                                   | Certified Reference Material CRM                                     | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com |



**Certified Reference Material CRM** 



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

|       |       |                            |        |         |       |            | Trace Me | tals | S Verifica   | tion | by ICP-        | Ś    | (µg/mL)    |      |       |     |            |     |       |
|-------|-------|----------------------------|--------|---------|-------|------------|----------|------|--------------|------|----------------|------|------------|------|-------|-----|------------|-----|-------|
| S S A | 40.02 | 0<br>2<br>2<br>2<br>2<br>2 | 40.02  | Er Dy   | <0.02 | Ho         | 4).02    | 臣    | 40.02<br>002 | A N  | 40.02<br>20.02 | R 7  | A A<br>8 8 | s: % | A ()  | 3 3 | 2 A<br>3 R | : ¥ | 40.02 |
|       | _     | n (1                       |        | 2 8     | A     | - 5        |          | Mg   | <0.01        | õ    | <0.02          | Rh   | <0.02      | Ag   | 40.02 | 3   | 6 8<br>8   | < 0 | 40.02 |
|       |       | 다.<br>                     | A 0.02 | ត្ន ខ្ល | 40.02 | <b>न</b> ह |          |      | 20.02        | 3 R  | 40.02          | R    | <0.02      | Na   | 40.2  | Ţ   | 40.02      | ₽¥  | <0.02 |
| _     | _     | 6                          | <0.02  | ନ୍ନ     | <0.02 | 5          |          |      | 3 6          | 7    | 20.02          | , Ku | 40.02      | Sr   | <0.02 | Тв  | <0.02      | ×   | <0.02 |
|       |       | ¥                          | <0.02  | Au      | <0.02 | 3          |          | N a  | 32           | 4 3  | <0.02          | 2    | 40.02      | 1 60 | 40.02 | S   | -0.02      | Za  | <0.02 |
|       |       |                            |        |         |       | I          |          | ļ    |              |      | -              | ą    | 2000       | La   | 20.02 | 11  | 20.02      | N   | 40.02 |

(T) = Target analyte

**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

In P. Str

Certified by:

\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.
\* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
\* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions.
 \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST
 \* Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part #: 57005 Lot # 071123

| $\begin{array}{c c c c c c c c c c c c c c c c c c c $                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | m/z->  | 2500 | m/z-> | 500 | m/z->-   | 2.5<br>114 | 5.OE4         | 1. Ammonium dihydrogen phosphate (P) | Compound                                                    | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below wa | CERTIFIED WEIGHT REPORT:<br>Par<br>Lo<br>De         | www.absolutestandards.com   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-------|-----|----------|------------|---------------|--------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------|
| R I D 2 M 4 C 1         M 52 15           Interview         Lat*           Solvent:         2111021         Nitric Acid           Provide (P)         2%         40.0         Nitric Acid           2000/2         0.058         Failure inventienty         Environmenty           2000/2         0.058         Failure inventienty         Environmenty         Environmenty           Nominia         Party Uncertainty Assay         Target         Actual         Actual         Commutated By:         Perford L Ren           10000         ease         0.10         27.5         72.7287         72.7287         72.7284         10000.0         30.0         772.751         5mg/r           12.074         aeoc)15891 16. D/r         Country [Linear)         Status         Stat                                                                                                                                                                                                               | N<br>O |      | 110   |     | 10       |            | [1] Spectrum  |                                      | -                                                           | Expiration Date:<br>Recommended Storage:<br>I Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below was d    | DRT:<br>Part Number:<br>Lot Number:<br>Description: | om                          |
| RICZINGLA         MITELS           Bolvent:         21110221         Nitric Acid           IDP         2%         40.0         Nitric Acid           SEC5         Balance locentary<br>(mL)         Nitric Acid         Formulated Br.         Formulated Br.           SEC5         Balance locentary<br>(mL)         Nitric Acid         Formulated Br.         Lawrence Balance<br>(mL)         Formulated Br.         Lawrence Balance<br>(mL)         Formulated Br.         Lawrence Balance<br>(mL)         Source It<br>Mitels Acid         Formulated Br.         Lawrence Balance<br>(ML)         Source It<br>Mitels Acid         Formulated Br.         Lawrence Balance<br>(ML)         Source It<br>Mitels Acid         Formulated Br.         Formulated Br | 2220   |      | 120   |     | N.<br>O  |            |               |                                      | Lot<br>Number                                               | 041726<br>Ambient (20<br><b>10000</b><br>6UTB<br>6UTB                                                                    | 57115<br>041723<br>Phosphore                        | 5                           |
| Hric Acid<br>Iric Acid<br>Iric Acid<br>Iric Acid<br>Iric Acid<br>Actual<br>Actual<br>Actual<br>Expanded<br>Expanded<br>Expanded<br>SDS Inf<br>Expanded<br>SDS Inf<br>Solvent Safety Inf<br>eight (g) Conc. (ug/mL) · (AS# OSHA PEL)<br>2.7289 10000.0 20.0 7722-76-1 5 mg/m<br>2.7289 10000.0 20.0 7722-76-1 5 mg/m<br>150 170 180 190 190 190                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 230    |      | 130   |     | ຜ.<br>ວ  |            | 2.074 sec]:58 |                                      |                                                             | 00.02                                                                                                                    | us (P)                                              | R                           |
| Hric Acid<br>Frite Acid<br>Formulated By: Lawrence Ba<br>Formulated By: Pedro L. Ren<br>Expanded<br>Actual Uncertainty (Solvent Safety Inf<br>eight (g) Conc. (ug/mL) - 4/- (ug/mL) CAS# OSHA PEL<br>2.7289 10000.0 20.0 7722-76-1 5 mg/m<br>2.7289 10000.0 1722-76-1 5 mg/m<br>160 170 180 190 190                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 240    |      | 140   |     | <b>4</b> |            | 3115.D# [Cot  |                                      | Uncertainty Assay<br>Purity (%) (%)                         | 2%<br>Balance Uncertainty<br>Flask Uncertainty                                                                           | Solvent:                                            | 22/09/12                    |
| Formulated By: Lawrence Ba<br>Formulated By: Lawrence Ba<br>Reviewed By: Pedro L. Ren<br>Conc. (ug/m), -/- (ug/m), CAS# OSHA PEL<br>10000.0 20.0 7722-76-1 5 mg/m<br>10000.0 20.0 7722-76-1 5 mg/m<br>10000.0 eio eio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 250    |      | 150   |     | S<br>O   |            | ınt] [Linear] |                                      |                                                             |                                                                                                                          |                                                     |                             |
| Formulated By: Lawrence Ba<br>Formulated By: Pedro L. Ren<br>Expanded SDS Inf<br>Uncertainty (Solvent Safety Inf<br>+/- (ug/mL) CAS# OSHA PEL (<br>20.0 7722-76-1 5 mg/m<br>20.0 7722-76-1 5 mg/m<br>20.0 190 90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 260    |      |       |     |          |            |               | 2.7289 10000.                        | Actual Actual<br>sight (g) Conc. (µg/1                      | rric Acid                                                                                                                | tric Acid                                           | 15815                       |
| 22-76-1 5 mg/m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |      |       |     | 1        |            |               | 20.0                                 |                                                             | Formulated B                                                                                                             | Q                                                   |                             |
| o 200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |      | 4     |     |          |            |               |                                      | SC<br>(Solvent Saf<br>CAS# OSH/                             | Ped                                                                                                                      | Gerence /                                           |                             |
| .hed pg.)<br>LbS0<br>LbS0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |      |       |     |          |            |               |                                      | <b>DS Information</b><br>fety Info. On Attac<br>A PEL (TWA) | L. Rentas                                                                                                                | Jan                                                 | https://At                  |
| g 3186 SRM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |      | 9     |     | J        |            |               |                                      | 0                                                           | 041723<br>041723                                                                                                         |                                                     | tps://Absolutestandards.com |

| <b>Abs</b> | Absolute (<br>800-368-1131<br>www.absolute                    | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com | <b>lards</b> ,<br>ds.com                                      | Inc.                                                                                                   | -                                                           |                                                               |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ĉ                                               | rtified Re                                                       | eren                               | Certified Reference Material CRM                  | ial CR                         | M                                                             |                     |                        |             |                               | https<br>AF   | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | 4 Accredited<br>cate Number<br>andards.com |
|------------|---------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------|------------------------------------|---------------------------------------------------|--------------------------------|---------------------------------------------------------------|---------------------|------------------------|-------------|-------------------------------|---------------|------------------------------------------------------------------------------------------|--------------------------------------------|
| -          | nstrum                                                        | iental A                                                              | nalysi                                                        | s by Indi                                                                                              | uctive                                                      | ły Coupl                                                      | ed Pla                                                        | Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | s Spec                                          | troscopy                                                         | (ICP                               | -MS):                                             |                                |                                                               |                     |                        |             |                               |               |                                                                                          |                                            |
| _          |                                                               |                                                                       |                                                               |                                                                                                        |                                                             |                                                               |                                                               | Trace Metals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | etals                                           | Verifica                                                         | Ition                              | Verification by ICP-MS                            | 1.00                           | (µg/mL)                                                       |                     |                        |             |                               |               |                                                                                          |                                            |
| -          | A                                                             | 40.02                                                                 | 8                                                             | 40,02                                                                                                  | Ą                                                           | 40.02                                                         | H                                                             | 40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | E                                               | A) ()2                                                           | Z                                  | A)22                                              | 7                              | A).02                                                         | Se                  | <b>A</b> 2             | ŧ           | AB                            | W             |                                                                                          |                                            |
|            |                                                               | A.22                                                                  | 5<br>2                                                        | A0.2                                                                                                   | ម្មា                                                        | 40.02                                                         | Но                                                            | 40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ŀ                                               | 40.02                                                            | NB                                 | <0.02                                             | Re                             | 40.02                                                         | ŝ                   | 40.02                  | Te          | 40.02                         | c :           | 40.02                                                                                    |                                            |
|            | Ba                                                            |                                                                       | <mark>ዮ</mark> የ                                              | 8 8<br>8<br>8                                                                                          | <u>ନ</u> ଜ                                                  | 40.02<br>20                                                   | 부 부                                                           | 40.02<br>20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mg                                              | 40.01<br>002                                                     | r S                                | A A<br>3 2                                        | ₽ ₽                            | A A<br>3 S                                                    | Å.                  | A) 02                  | <b>1</b> 11 | A 600                         | \$ <          | 8 8                                                                                      |                                            |
|            |                                                               | 10.0>                                                                 | ព្                                                            | <0.02                                                                                                  | ណ្ឌ                                                         | <0.02                                                         | 장                                                             | <0.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Hg                                              | 40.2                                                             | שי                                 | T                                                 | R Q                            | 40.02                                                         | K 2                 | 8.8<br>2               |             | <0.02                         | 4 'B          | 60.02<br>20.02                                                                           |                                            |
|            | B                                                             | 8 8<br>22<br>22                                                       | 5 S                                                           | 8 8<br>22<br>22                                                                                        | ନ ବ                                                         | 40.02<br>20                                                   | 32                                                            | 4 4 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | N W                                             | 4 4<br>8<br>8                                                    | * 7                                | A0.02                                             | s s                            | A A<br>3 S                                                    | y s                 | 88                     | 1 S         | <b>A A A A</b>                | 2 B           | 88                                                                                       |                                            |
|            |                                                               |                                                                       |                                                               |                                                                                                        |                                                             |                                                               |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 | (T)= Ta                                                          | (T)= Target analyte                | alyte                                             |                                |                                                               | ĺ                   |                        |             |                               |               |                                                                                          |                                            |
| hand       | hysical                                                       | Physical Characterization:                                            | cteriza                                                       | ution:                                                                                                 |                                                             |                                                               |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |                                                                  |                                    |                                                   |                                |                                                               |                     |                        |             | Cer                           | Certified by: | y:                                                                                       |                                            |
| -          | Iomogen                                                       | eity: No I                                                            | heteroge                                                      | neity was                                                                                              | observ                                                      | ed in the pr                                                  | eparati                                                       | Homogeneity: No heterogeneity was observed in the preparation of this standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ındard.                                         |                                                                  |                                    |                                                   |                                |                                                               |                     |                        | (           | h                             | J.            | Ŵ                                                                                        |                                            |
| * *        | The cel<br>Purified                                           | rtified va<br>l acids,                                                | alue is<br>18.2 m                                             | The certified value is the concen<br>Purified acids, 18.2 megohm dei<br>the menantion of all standards | centrat<br>deioniz                                          | tion calcul<br>red water,                                     | lated f                                                       | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all etandarde                                                                                                                                                                                                                                                                                                                                                                              | metric<br>s A gla                               | and volu                                                         | metric<br>nd the                   | measure<br>highest p                              | nents<br>Jurity r              | unless oth<br>aw mater                                        | nerwisc<br>ials are | e stated.<br>9 used in |             |                               |               |                                                                                          |                                            |
| * * * * *  | All star<br>Standa<br>Standa<br>All Star<br>Uncerta<br>Measur | ndard co<br>rds are  <br>rds are  <br>ndards s<br>ainty Re<br>rement  | ntaine<br>prepare<br>certife<br>hould I<br>ference<br>Result, | rs are me<br>ad gravin<br>d (+/-) 0<br>es storec<br>e: Taylor<br>" NIST Te                             | eticulo<br>netrica<br>).5% o<br>d with<br>r, B.N.<br>echnic | ally using<br>the stat<br>caps tigh<br>and Kuya<br>al Note 1; | hed pri<br>balanc<br>iced val<br>it and<br>it, C.E.<br>297, L | <ul> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All Standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).</li> </ul> | e calit<br>other<br>ropriat<br>nes for<br>nment | brated wit<br>wise stat<br>te laborat<br>Evaluatir<br>Printing ( | h weig<br>ed.<br>ory co<br>Office, | )hts trace<br>onditions.<br>Expressir<br>Washingt | able to<br>og the l<br>on, D.( | to NIST (see above).<br>e Uncertainty of NIST<br>D.C. (1994). | e abov<br>ty of N   | e).<br>IIST            |             |                               |               |                                                                                          |                                            |
|            |                                                               |                                                                       |                                                               |                                                                                                        |                                                             |                                                               |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |                                                                  |                                    |                                                   |                                |                                                               |                     |                        |             |                               |               |                                                                                          |                                            |
|            |                                                               |                                                                       |                                                               |                                                                                                        |                                                             |                                                               |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |                                                                  |                                    |                                                   |                                | ·                                                             |                     |                        |             |                               |               |                                                                                          |                                            |
|            |                                                               |                                                                       |                                                               |                                                                                                        |                                                             |                                                               |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 | 8                                                                |                                    |                                                   |                                |                                                               |                     |                        |             |                               |               |                                                                                          |                                            |
| Part #     | 57115                                                         |                                                                       | Lot # 041723                                                  | 1723                                                                                                   |                                                             |                                                               |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                 |                                                                  | 2 of 2                             | of 2                                              |                                |                                                               |                     |                        | Print       | Printed: 2/8/2024, 5:01:22 PM | 24, 5:0       | )1:22 PM                                                                                 |                                            |

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| m/z->   | N.<br>01<br>00 | 5.<br>O<br>M<br>8 | m/z->    | 5.0E7 | 1.0E8 | m/z->                                     | N. 00<br>00                                          | 5.0E5                                 | Ammonium sulfate (S)   | Compound                                                                           | NIST Test Number: 6UTB<br>Weight shown below was diluted to (mL): | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): | Part Number:<br>Lot Number:<br>Description:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 800-368-1131<br>www.absolutestandards.com                   |
|---------|----------------|-------------------|----------|-------|-------|-------------------------------------------|------------------------------------------------------|---------------------------------------|------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 210     |                |                   | 110      |       |       | 10                                        |                                                      | [1] Spectrum No.1                     | IN117                  | RM#                                                                                | umber:<br>low was dilute                                          | n Date:<br>lorage:<br>lg/mL):                                              | <u>Part Number:</u><br>Lot Number:<br>Description:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                             |
| 220     |                |                   | 120      |       |       | NO                                        |                                                      | -                                     | IN117 SLBR7225V        | Lot<br>Number C                                                                    | GUTB<br>d to (mL):                                                | 122926<br>Ambient (20 °C)<br>1000                                          | <u>57016</u><br>122923<br>Sulfur (S)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                             |
| 230     |                |                   | 130      |       | 9     | 30                                        |                                                      | 33.603 80                             | 1000                   | Nominal F<br>Conc. (µg/mL)                                                         | 4000.0 5                                                          | ĉ                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>b</i>                                                    |
| N<br>40 |                |                   | 140      |       |       | <b>b</b>                                  | den gegen og gener første kommen och som en forse og | 33.603 sec]:57016.D# [Count] [Linear] | 99.9 0.10 24.3         | Purity Uncertainty Assay<br>(%) Purity (%) (%)                                     | 5E-05 Balance Uncertainty<br>0.06 Flask Uncertainty               |                                                                            | Solvent:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Certified Re                                                |
| N 80    |                |                   | 100      |       |       | 50                                        |                                                      | Count] [Lin                           | .3 16.4979             | say Target<br>6) Weight (g)                                                        | Y                                                                 |                                                                            | Lot #<br>122923                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | fere<br>12                                                  |
| N80     |                |                   | <b>0</b> |       |       | 8                                         |                                                      | 9<br>9<br>7                           | 16.4980                | Actual<br>Weight (g)                                                               |                                                                   |                                                                            | ASTM Type 1 Water                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | aterial CRM                                                 |
|         |                |                   | 170      |       |       | 70                                        |                                                      |                                       | 1000.0                 | Actual (<br>Conc. (µg/mL)                                                          | 5                                                                 |                                                                            | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | rm<br>167816-                                               |
|         |                |                   | 180      |       |       | 80                                        |                                                      |                                       | 2.0 77                 | Expanded<br>Uncertainty<br>+/- (µg/mL)                                             | Reviewed By:                                                      | M                                                                          | Formulated By:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             |
|         |                |                   |          |       |       | <ul> <li>Complete and complete</li> </ul> |                                                      |                                       | 7783-20-2              | (Solvent :<br>CAS# 05                                                              | Pedr                                                              | \$                                                                         | a and a second sec |                                                             |
|         |                |                   | 190      |       |       | 0                                         |                                                      |                                       | NA                     | SDS Information<br>It Safety Info. On Attac<br>OSHA PEL (TWA)                      | Pedro L. Rentas                                                   | e la                                                                       | Benson Chan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | http                                                        |
|         |                |                   | 2000     |       |       | 100                                       |                                                      |                                       | ort-rat 4250mg/kg 3181 | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD50 | 122923                                                            | 7                                                                          | 100002                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | AR-1539 Certificate Number<br>https://Absolutestandards.com |

| Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | <ul> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* All standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* All standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST</li> </ul> | <ul> <li>The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the measurement of all standards</li> </ul> |        | Homogeneity: No heterogeneity was observed in the preparation of this standard. | Physical Characterization: | (T) = Target analyte | AI         A002         Cd         A002         Pr         A002         Pr | Trace Metals Verification by ICP-MS (µg/mL) | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------------------------------------------------------------------------|----------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 30)<br>                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                    | 5<br>2 | I She                                                                           | Certified by:              |                      | MI         MI<                                         |                                             |                                                                                 | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

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|                                                                                                                                 | -                 | 260                  | 250                  | 240                                      | 230           |                           | 220                                              | 210                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | m/z->                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------|----------------------|------------------------------------------|---------------|---------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|                                                                                                                                 |                   |                      |                      |                                          |               |                           |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.0巨5。                                                                                         |
|                                                                                                                                 |                   |                      |                      |                                          |               |                           |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2.0厘5                                                                                          |
| 180 190 200                                                                                                                     | 170               | 160                  | 150                  | 140                                      | 130           | р. 9                      | 120                                              | 110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | m/z->                                                                                          |
|                                                                                                                                 |                   |                      |                      |                                          |               |                           |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2,5E                                                                                           |
|                                                                                                                                 |                   |                      |                      |                                          |               |                           |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5.0E5                                                                                          |
| 80 80 100                                                                                                                       | 70                | eo                   | 50                   | <b>40</b>                                | 8             | magan Raji Anana ya Anany | N                                                | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | m/z->                                                                                          |
|                                                                                                                                 |                   |                      |                      |                                          |               |                           |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1000                                                                                           |
|                                                                                                                                 |                   | ear)                 | ount] [Lin           | 24.004 sec];58116,D# [Count] [Linear]    | ¢ sec];58     | [ 24.00                   |                                                  | [1] Spectrum No.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2000                                                                                           |
| 20.0 7763-20-2 NA orf-rat 4250mg/kg 3181                                                                                        | 10000.1           | 82,4682              | 82.4675              | 0.10 24.3                                | 99,9          | 10000                     | IN117 SLBR7225V                                  | IN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1. Ammonium sulfate (S)                                                                        |
| Expanded SDS Information<br>Uncertainty (Solvent Safety Info. On Attached pg.) NIST<br>+/- (ug/mL) CAS# OSHA PEL (TWA) LDSO SRM | (g) Conc. (µg/mL) | Actual<br>Weight (g) | Target<br>Weight (g) | Uncertainty Assay<br>Purity (%) (%)      | Purity<br>(%) | Nominal<br>Conc. (µg/mL)  | Lot.<br>Number                                   | RM#                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Compound                                                                                       |
| i By: Ped                                                                                                                       | [F                |                      |                      | Balance Uncertainty<br>Flask Uncertainty | 0.058         | 1999.48                   | led to (mL):                                     | Weight shown below was diluted to (mL):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Weight show                                                                                    |
| Lawrence barry                                                                                                                  | 1 1               |                      |                      |                                          |               | 20 °C)                    | 071126<br>Ambient (20 °C)<br><b>10000</b><br>Sum | Expiration Date:<br>nended Storage:<br>htration (µg/mL):<br>%T Test Number:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Teet Number |
| around Bring                                                                                                                    | Type 1 Water      | ASTM Ty              | Lot#<br>071123       | Solvent:                                 |               | E)                        | 57116<br>071123<br>Sulfur (S)                    | <u>PORT:</u><br>Part Number:<br>Lot Number:<br>Description:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CERTIFIED WEIGHT REPORT:<br>Part N<br>Lot N<br>Desc                                            |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com                                        | CRM               |                      | ference M            | Certified Reference Material             | R a           |                           |                                                  | om                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                          |
|                                                                                                                                 |                   |                      |                      |                                          |               |                           |                                                  | And in case of the local division of the loc |                                                                                                |

| 800-368-1131<br>www.absolutestandards.com                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                             | 0                                                                                                                           | Certified Reference Material CRM                                                                                       | nce Material C                                                      | RM                                                      |                         |           | •          | ANAB ISO 1:<br>AR-1539 Ce<br>https://Absolut | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------|-------------------------|-----------|------------|----------------------------------------------|------------------------------------------------------------------------------------------|
| Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):                                                                                                                                                                                                                                                                                                                                                                                                                       | ictively Coupled                                                                                            | Plasma Mass Sp                                                                                                              | ectrometry (IC                                                                                                         | P-MS):                                                              |                                                         |                         |           |            |                                              |                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                             | Trace Metals                                                                                                                |                                                                                                                        | Verification by ICP-MS                                              | IS (µg/mL)                                              |                         |           |            |                                              |                                                                                          |
| AI <0.02 Cd <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Dv 40.02                                                                                                    | A M                                                                                                                         | -12                                                                                                                    |                                                                     |                                                         | a dista div.            | ALL MERCY |            | A STREET STREET STREET                       |                                                                                          |
| 40.02<br>Ca                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                             | 40.02                                                                                                                       | 40.02<br>40.02                                                                                                         | Ni <0.02<br>Nb <0.02                                                | Pr <0.02<br>Re <0.02                                    | Si Se                   |           |            |                                              | A 6.3                                                                                    |
| 50 C C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Gd <0.02                                                                                                    | In <0.02 N                                                                                                                  | Mg <0.01 C                                                                                                             |                                                                     |                                                         |                         |           |            | < 0                                          | <0.02                                                                                    |
| 40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Ga<br>40.02                                                                                                 | Fe <0.2 Hg                                                                                                                  | A A<br>3 12                                                                                                            | 8 8                                                                 |                                                         |                         | 12 1      |            | 40.02 Y 40.02                                | 40.02<br>20.02                                                                           |
| B (UUZ CI 40,02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Au <0.02                                                                                                    | <0.02                                                                                                                       | <0.02                                                                                                                  |                                                                     | Sc <0.02                                                | Ta o                    | <0.02     |            | 40.02<br>21<br>21<br>40                      | 40.02                                                                                    |
| Physical Characterization:                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                             |                                                                                                                             | (T)= Target analyte                                                                                                    | alyte                                                               |                                                         |                         |           | ۲<br>۲     | Certified by:                                |                                                                                          |
| Homogeneity: No heterogeneity was observed in the preparation of this standard.                                                                                                                                                                                                                                                                                                                                                                                                                       | oserved in the prepa                                                                                        | ation of this standard                                                                                                      |                                                                                                                        |                                                                     |                                                         |                         |           |            |                                              | 1                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                             |                                                                                                                             |                                                                                                                        |                                                                     |                                                         |                         | (         | the second | P.S.                                         |                                                                                          |
| <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements</li> <li>* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity in the preparation of all standards.</li> <li>* All standard containers are meticulously cleaned prior to use the preparation of the preparation of all standards.</li> </ul>                                                                                                 | ntration calculate<br>ionized water, ca                                                                     | d from gravimetri<br>librated Class A g                                                                                     | c and volumetric<br>lassware and the                                                                                   | c measurement<br>highest purity                                     | s unless otherwise stated.<br>raw materials are used in | ise state<br>are used i | 5.6       |            |                                              |                                                                                          |
| * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.                                                                                                                                                                                                                                                                                          | trically using bala<br>% of the stated                                                                      | value, unless othe                                                                                                          | brated with weighwise stated.                                                                                          | phts traceable :                                                    | to NIST (see ab                                         | ove).                   |           |            |                                              |                                                                                          |
| * Uncertainty Reference: Taylor,<br>Measurement Result," NIST Tec                                                                                                                                                                                                                                                                                                                                                                                                                                     | vith caps tight ar<br>B.N. and Kuyat, (<br>hnical Note 1297                                                 | id under appropria<br>2.E., "Guidelines fc<br>, U.S. Governmen                                                              | ite laboratory co<br>r Evaluating and<br>t Printing Office,                                                            | I Expressing the<br>Washington, D                                   | <sup>9</sup> Uncertainty of NIST<br>).C. (1994).        | F NIST                  |           |            |                                              |                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ·                                                                                                           |                                                                                                                             |                                                                                                                        |                                                                     |                                                         |                         |           |            |                                              |                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                             | ð                                                                                                                           |                                                                                                                        |                                                                     |                                                         |                         |           |            |                                              |                                                                                          |
| * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to<br>* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>* All standards should be stored with caps tight and under appropriate laboratory conditions.<br>* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D. | itrically using bails<br>bails of the stated<br>with caps tight ar<br>B.N. and Kuyat, C<br>hnical Note 1297 | prior to use.<br>ances that are cali<br>value, unless othe<br>d under appropria<br>2.E., "Guidelines fo<br>, U.S. Governmen | brated with weig<br>rwise stated.<br>re laboratory co<br>or Evaluating and<br>t Printing Office,<br>t Printing Office, | ghts traceable .<br>onditions.<br>I Expressing the<br>Washington, C | to NiST (see ab<br>3 Uncertainty o<br>).C. (1994).      | ove).<br>F NIST         |           |            |                                              |                                                                                          |

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| $\begin{array}{c c c c c c c c c c c c c c c c c c c $                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | m/z>    | ζι<br>Ο<br>Μ<br>Ο | m/z-><br>1.0E6 | ₩/z-><br>2.0E6 | 5000<br>2500                | Compound<br>1. Ammonium hexafluorosilicate (Si)                                                                                  | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below wa | <u>CERTIFIED WEIGHT REPORT:</u><br>Part Nu<br>Lot Nu<br>Descri | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------|----------------|----------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Certified Reference Material CRM       A: 12: p 4: 2.4     Ph/SI R       Solvent:     24002546       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     40.0       2%     1140       1140     12.865       111     12.865       111     12.865       111     12.865       111     12.865       111     12.865       111     12.865       111     12.865       111     12.865       111     12.865       111     12.865       111     12.9       111     12.9       111     12.9       111     13.865       111     14.0       111     14.0       111     14.0       111     11.9 <th></th> <th></th> <th></th> <th></th> <th></th> <th>Lot<br/>RM# Number<br/>IN009 SID082022A1</th> <th>s dilute</th> <th>mber:<br/>mber:<br/>ption:</th> <th>, Inc.</th>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |                   |                |                |                             | Lot<br>RM# Number<br>IN009 SID082022A1                                                                                           | s dilute                                                                                                                 | mber:<br>mber:<br>ption:                                       | , Inc.                                                                                   |
| Instant     Image: Constraint of the con | ≥<br>40 |                   | 140            | <b>4</b>       | 1.393 sec]:58014.D# [Count] | Purity         Uncertainty         Assay           (%)         Purity (%)         (%)           99.999         0.10         14.4 | 2%<br>5E-05 Balance Uncertainty<br>99.48 0.058 Flask Uncertainty                                                         |                                                                | Certified Reference                                                                      |
| v: Aleah O'Brady<br>V: Aleah O'Brady<br>CAS# OSHA PEL (TM<br>919-19-0 2.5 mg/m:<br>919-19-0 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | N       |                   | 160            | 0-<br>         | Linear]                     | Actual Actual<br>Weight (g) Conc. (Jy/mL)<br>13.8855 <b>1000.0</b>                                                               | Nitric Acid                                                                                                              | Nitric A                                                       | 182                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |                   | (*)            |                |                             | (Solvent S<br>CAS# ()<br>18919-19-0                                                                                              | Ped Ped                                                                                                                  | ha                                                             | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

**≤ % >** 



**Certified Reference Material CRM** 



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

# Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS);

|          |              |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |       |    | I race M            | etals | Verifica      | ition | by ICP-N     | E<br>S | g/mL) |            |                            |                       |       |     |               |
|----------|--------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|----|---------------------|-------|---------------|-------|--------------|--------|-------|------------|----------------------------|-----------------------|-------|-----|---------------|
|          |              |     | Contraction of the local division of the loc |          |       |    | antine we have been |       | A DAMAGENERAL |       |              |        |       |            | A CALCULATION OF THE OWNER | and the second second |       |     | STOLES WANTED |
| A        | 40.02        | ß   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Dy       | <0.02 | Hf | <0.02               | 5     | <0.02         | N     | 40.02        | Pr     | <0.02 | Se         | <0.2                       | 1                     | 40.02 | W   | 400           |
| <b>S</b> | <0.02        | ក្ខ | <b>A</b> 0,2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 막        | A0,02 | Но | A).02               |       | <0.02         | Ş     | 3            | đ      | 3     | 9          | 4                          | 9                     |       | : : | 0.02          |
| Ac       | 3            | Ş   | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | đ        | 3     | •  |                     | ;     |               |       |              | -      |       | ç          | •                          | 10                    | 70.02 | c   | 20.02         |
| J I      | 1            | Ę   | NU.U2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2        | 20.05 | B  | 20.02               | Mg    | <0.01         | 9     | 40.02        | Rh     | 4).02 | Ą          | A0.02                      | H                     | 40.02 | <   | A).02         |
| 58       | 20.02        | S   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ନୁ       | 40.02 | F  | 40.02               | Mn    | 40.02         | P     | A).02        | Rb     | 400   | Ž          | 41,7                       | Ţ.                    | 3     | \$  | 3             |
| Be       | <b>40.01</b> | ନ   | 40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>G</b> | 3     | ž1 | 3                   | Ę     | 3             | 9     | 3            | 7      | 3     |            | 2                          | 1                     |       |     | 10.04         |
| d.       | 3            | 2   | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | )        |       |    |                     | 9.1   | 10.4          | 'n    | 20.02        | N      | 20.05 | ų          | 20.02                      |                       | 20.02 | ×   | <0.02         |
|          | 20.02        | S   | 20.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ନ୍ନ      | 20.02 | 5  | 40.02               | Mo    | <0.02         | 7     | A.0          | SB     | <0.02 | Ś          | <0.02                      | 8                     | 2002  | 7   | 3             |
| t        | <0.02        | 2   | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Au       | 40.02 | \$ | A0.02               | Nd    | 40,02         | ĸ     | <b>4</b> 0.2 | 8      | 40.03 | <u>_</u> ] | 3                          | 1                     | 3     | 2   | 3             |

(T) = Target analyte

**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

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Certified by:

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.

\* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

\* All Standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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Part # 57014 Lot # 122023



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**Certified Reference Material CRM** 



AR-1539 Certificate Number https://Absolutestandards.com ANAB ISO 17034 Accredited

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

(T) = Target analyte

**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

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\* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58030 Lot # 111623

| Image:                                                                                                                                                                                                                                                                                                                                                                             | m/z->- | 2500 | 5000 | m/z-> | 500 | m/z-> | 2.5 m<br>4 | 5.0E4 | 1. Ammonium dihydrogen phosphate (P) IN008 Pvœ2019A1 | Compound                                       | Weight shown below was diluted to (mL): | NIST Test Number:         | Recommended Storage: | Expiration Date: | Lot Number:<br>Description: | CERTIFIED WEIGHT REPORT:<br>Part Number: | www.absolutestandards.com |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|------|-------|-----|-------|------------|-------|------------------------------------------------------|------------------------------------------------|-----------------------------------------|---------------------------|----------------------|------------------|-----------------------------|------------------------------------------|---------------------------|
| ric Acid<br>Fic Acid<br>Formulated By:<br>Formulated                                                                                     |        |      |      | 120   |     | 20    |            |       |                                                      | Lot<br>Number                                  |                                         |                           |                      |                  |                             |                                          | R                         |
| ric Acid<br>Fic Acid<br>Formulated By:<br>Formulated                                                                                     | 240    |      |      | 140   |     | 40    |            |       | 99.999 0.10 27.5 7.27                                | Purity Uncertainty Assay<br>(%) Purity (%) (%) | 0.058 Flask Uncertainty                 | 5E-05 Balance Uncertainty |                      |                  |                             |                                          | 00                        |
| Prieved By:<br>Programity<br>Procertainty<br>Procentainty<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>Processory<br>P |        |      |      |       |     |       |            |       | .2730                                                | Actual Actual<br>Weight (g) Conc. (µg/mL)      |                                         |                           |                      | Nitric Acid      |                             |                                          | M5820                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |      |      | 180   |     |       |            |       | 7722-76-1                                            | ) CAS                                          |                                         |                           | Here ten             | Lawrence         | Karone L                    |                                          | ٩                         |

|                                                                                          | 11:19 PM                                     | 024, 5:0      | Printed: 2/8/2024, 5:01:19 PM         | Print   |                                       |                                |                                                                                                  |                    |                                                                                                             | 2 of 2                                            |                                                                                                |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                              |                                                                                                               |                                                                                            | 123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Lot # 091123                                                              | Lot                                                                            | 57015                                                                                                                                                                                                                                                                                                            | Part # 5                                 |
|------------------------------------------------------------------------------------------|----------------------------------------------|---------------|---------------------------------------|---------|---------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
|                                                                                          |                                              |               |                                       |         |                                       |                                |                                                                                                  |                    |                                                                                                             |                                                   |                                                                                                |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5                                                                            |                                                                                                               | · ·                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ð                                                                         |                                                                                |                                                                                                                                                                                                                                                                                                                  |                                          |
|                                                                                          |                                              |               |                                       |         | e).<br>IST                            | rials are<br>e abov<br>ty of N | ity raw materials are us<br>le to NIST (see above).<br>the Uncertainty of NIST<br>, D.C. (1994). | able to<br>on, D.( | highest p<br>ts trace;<br>ditions.<br>Xpressin<br>Vashingt                                                  | id the f<br>id.<br>yry con<br>y and E<br>ffice, V | sware ar<br>ated with<br>ise state<br>laborate<br>ivaluation<br>rinting O                      | A glas<br>calibr<br>otherw<br>opriate<br>is for E<br>ment P | to use.<br>that are<br>that are<br>der apprider appri-<br>Guideline<br>. Governu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | calibrat<br>ad prior<br>alances<br>d value<br>and un<br>, C.E., "<br>97, U.S | d water,<br>sly clean<br>y using b<br>y using b<br>the state<br>the state<br>hps tight<br>nd Kuyat<br>Note 12 | eionize<br>s.<br>ticulou:<br>ticulou:<br>9% of 1<br>5% of 1<br>B.N. a<br>B.N. a<br>b.n.cal | <ul> <li>Purmed acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.</li> <li>All standard containers are meticulously cleaned prior to use.</li> <li>Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>All Standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).</li> </ul> | 8.2 me<br>of all s<br>repared<br>ertifed<br>ertifed<br>srence:<br>srence: | aration<br>ard con<br>s are pr<br>s are ce<br>ards shu<br>ty Refe<br>nent Refe | <ul> <li>Purmed acids, 18.2 meg<br/>the preparation of all si</li> <li>All standard containers</li> <li>Standards are prepared</li> <li>Standards are certifed (</li> <li>All Standards should be</li> <li>Uncertainty Reference:<br/>Measurement Result," Measurement Result, " Measurement Result,"</li> </ul> | <u>*****</u>                             |
|                                                                                          | Ŵ                                            | J.            | in the second second                  | ſ       | stated                                | henwise                        | unless of                                                                                        | nents              | neasurer                                                                                                    | netric n                                          | nd volur                                                                                       | letric a                                                    | m gravin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ted fro                                                                      | n calcula                                                                                                     | intratio                                                                                   | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ue is th                                                                  | fied value                                                                     | ie certif                                                                                                                                                                                                                                                                                                        | * *                                      |
|                                                                                          | Y.                                           | Certified by: | Ce                                    |         |                                       |                                |                                                                                                  |                    |                                                                                                             |                                                   |                                                                                                | idard.                                                      | of this star                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | paration                                                                     | in the pre                                                                                                    | bserved                                                                                    | r nysical Unaracterization:<br>Homogeneity: No heterogeneity was observed in the preparation of this standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>terizat</b><br>eterogen                                                | y: No he                                                                       | r nysical Characterization:<br>Homogeneity: No heterogeneity                                                                                                                                                                                                                                                     | Hor                                      |
|                                                                                          |                                              |               |                                       |         |                                       |                                |                                                                                                  |                    | ıalyte                                                                                                      | (T) = Target analyte                              | E<br>E                                                                                         |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                              |                                                                                                               |                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                           | \$                                                                             |                                                                                                                                                                                                                                                                                                                  |                                          |
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|                                                                                          |                                              |               |                                       |         |                                       |                                | (µg/mL)                                                                                          |                    | Y ICP-N                                                                                                     | ion b                                             | Verification by ICP-MS                                                                         | tals V                                                      | Trace Metals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 글                                                                            |                                                                                                               |                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                           |                                                                                |                                                                                                                                                                                                                                                                                                                  |                                          |
|                                                                                          |                                              |               |                                       |         |                                       |                                |                                                                                                  |                    | MS):                                                                                                        | (ICP-)                                            | rometry                                                                                        | Spect                                                       | na Mass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | d Plası                                                                      | Couple                                                                                                        | ictively                                                                                   | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | nalysis                                                                   | otal An                                                                        | itrume                                                                                                                                                                                                                                                                                                           | 1 5                                      |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | IAB ISO 170<br>7-1539 Certi<br>s://Absolutes | https         |                                       |         |                                       |                                | 2                                                                                                | ial CRM            | e Mater                                                                                                     | ference                                           | Certified Reference Material                                                                   | Cert                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                              | V                                                                                                             |                                                                                            | Inc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>ards,</b><br>Is.com                                                    | tandard:                                                                       | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                                                                                                                                                                                                                                            | Absolute<br>800-368-1131<br>www.absolute |
|                                                                                          |                                              |               |                                       |         |                                       |                                |                                                                                                  |                    |                                                                                                             |                                                   |                                                                                                |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                              |                                                                                                               |                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                           |                                                                                |                                                                                                                                                                                                                                                                                                                  |                                          |

| N IC | 1.008 | 2.0E8  |               | m/z-> 10 | [1] Spectrum No.1<br>1.0E4            | 1. Selenium (Se)     |                                  | Compound                                                  | Volume shown below was diluted to (mL): | NIST Test Number:   | Recommended Storage:<br>Nominal Concentration (µg/mL): | Expiration Date: | Description:   | Part Number: | CERTIFIED WEIGHT REPORT: | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |  |
|------|-------|--------|---------------|----------|---------------------------------------|----------------------|----------------------------------|-----------------------------------------------------------|-----------------------------------------|---------------------|--------------------------------------------------------|------------------|----------------|--------------|--------------------------|------------------------------------------------------------------------------------------|--|
| Ċ    |       | C      | )             | U        | Z                                     | 58134                |                                  | Part                                                      | as diluteo                              | 0                   | -                                                      |                  |                | ר ונח        |                          |                                                                                          |  |
| ) )) |       | N      | 1             | 20       | -                                     | 071223               |                                  | Lot                                                       | to (mL):                                | 6UTB                | Ambient (20 °C)<br>1000                                | 060627           | Selenium (Se)  | 57034        |                          |                                                                                          |  |
|      |       | ,      | L.            | ω        | 33.702                                | 0.1000               |                                  | Dilution                                                  | 2000.07                                 |                     | ()-<br>()                                              |                  | (Se)           |              |                          |                                                                                          |  |
| NGC  |       | ŭ      | 5             | 30       | 80<br>[]<br>50<br>8                   | 200.0                |                                  | Initial                                                   | 0.100                                   | 5E-05               |                                                        |                  |                |              |                          |                                                                                          |  |
| N40  |       | 4      |               | 40       | 034.D#                                | 0.084                | A and Arrively a shared from the | Uncertainty<br>Pinette (ml.)                              | Flask Uncertainty                       | Balance Uncertainty |                                                        |                  |                |              |                          | M 5                                                                                      |  |
| NUC  |       | 0      | L<br> -<br> - | 50       | 33.702 sec]:58034.D# [Ccunt] [Linear] | 1000                 | , can ted to the                 | Nominal                                                   | ainty                                   | ortainty            |                                                        |                  | 2 0%           | 24002546     | Lot #                    | artified Reference<br>Mら962                                                              |  |
| NOO  |       |        |               | 60       | inear]                                | 10002.5              | Course (Page 111-)               | Initial                                                   |                                         |                     |                                                        | (mL)             | 40 0           | Nitric Acid  | Solvent:                 | Certified Reference Material CRM<br>Mら962 R!のC                                           |  |
|      |       | L<br>0 |               | 70       |                                       | 1000.0               |                                  | Final                                                     |                                         |                     |                                                        |                  | Nitric Acid    |              |                          | 114                                                                                      |  |
|      |       | c      |               |          |                                       | 2.2                  | TT OPY III-/                     | Expanded<br>Uncertainty                                   |                                         | Reviewed By:        | NS VS                                                  | - online         | Formulated Rv: |              |                          | 124                                                                                      |  |
|      |       | 08 L   |               | 80       |                                       | 7782-49-2            |                                  | <b>.</b>                                                  |                                         | y:                  | d'as                                                   | 0                | Rv.            | , I          |                          | -                                                                                        |  |
|      |       | OGL    |               | 90       |                                       | 0.2 mg/m3            |                                  | SDS Information<br>nt Safety Info. On Att                 |                                         | Pedro L. Rentas     | Ento                                                   |                  | Rencon Chan    |              |                          | 3                                                                                        |  |
|      |       | 200    |               | 100      |                                       | 3 orl-rat 6700 mg/kg |                                  | SDS Information<br>(Solvent Safety Info. On Attached pg.) |                                         | itas 060624         | /                                                      |                  | DRDR04         | 3            |                          | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |  |
|      | <br>  |        |               | <br>     |                                       | 3149                 | - Pick                           | NIST                                                      |                                         | 24                  |                                                        | 1                | <u>× </u>      |              |                          | Accredited<br>tte Number<br>idards.com                                                   |  |

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|                                                                                          | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise st.<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are us<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. 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(1</li> </ul> | ed fron<br>alibrate<br>lances<br>I value,<br>I value,<br>C.E., "u<br>7, U.S.                     | The certified value is the concentration calculated from gravi<br>Purified acids, 18.2 megohm deionized water, calibrated Class<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that ar<br>Standards are certifed (+/-) 0.5% of the stated value, unless<br>All standards should be stored with caps tight and under app<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin<br>Measurement Result," NIST Technical Note 1297, U.S. Gover | ntratio<br>s.<br>iculous<br>etrically<br>5% of t<br>B.N. ar<br>B.N. ar | The certified value is the concen<br>Purified acids, 18.2 megohm dei<br>the preparation of all standards.<br>All standard containers are meti<br>Standards are prepared gravime<br>Standards are certifed (+/-) 0.5<br>All standards should be stored w<br>Uncertainty Reference: Taylor, E<br>Measurement Result," NIST Tech | alue is t<br>1 of all :<br>ntainers<br>prepare<br>certifed<br>ference:<br>lesult," | The certified value is th<br>Purified acids, 18.2 meg<br>the preparation of all st<br>All standard containers<br>Standards are prepared<br>Standards are certifed (<br>All standards should be<br>Uncertainty Reference:<br>Measurement Result," N | * The ce<br>* Purifie<br>* All stand:<br>* Stand:<br>* All stand:<br>* Uncert<br>Measu | <b></b> |
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| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $                                  | Se         T           Si         40.02           Ag         40.02           Na         40.02           Na         40.02           Sr         40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pr 40.02<br>Re 40.02<br>Rh 40.02<br>Rh 40.02<br>Rb 40.02<br>Sc 40.02<br>Sc 40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ul> <li>40.02</li> <li>40.02</li></ul> | PP<br>R<br>K                                                        | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02                                         | Li<br>Lu<br>Mg<br>Hg<br>Nd                                         | 40.02<br>40.02<br>40.02<br>40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F<br>F | 40.02<br>40.02<br>40.02<br>40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Dy<br>Er<br>Ga<br>Au                                                   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                                                                                                                                                                                                                                                                                     | 5 C C C C C C                                                                      | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02                                                                                                                                                                                        | Al<br>As<br>Ba<br>Bi<br>Bi                                                             |         |
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by ICP-MS                                                  | s Spectrom<br>Metals V                                             | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):<br>Trace Metals Verification by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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      |                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                        | Inc.                                                                                                                                                                                                                                                                                                                          |                                                                                    | Absolute Standards,<br>800-368-1131<br>www.absolutestandards.com                                                                                                                                                                                   | Absolute<br>800-368-1131<br>www.absolute                                               | 800-    |



| Part# 57003 Lot # 062124        | <ul> <li>* The certified value is the concentration calculated from gravimetric and volumer<br/>* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and 1<br/>the preparation of all standards.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravinetrically using balances that are calibrated with w<br/>* Standards are certified (+/) 0.5% of the stated value, unless otherwise stated.</li> <li>* All Standards should be stored with caps tight and under appropriate iaboratory<br/>* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating of<br/>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Off</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Homogeneity: No heterogeneity was observed in the preparation of this standard. | Physical Characterization: | Al         4002         Cd         4002         Dy         4002         Hf           Sb         4002         Ca         402         Eu         4022         Hi           As         402         Ca         402         Eu         4022         In           Ba         4002         Ca         4002         Gd         4002         In           Ba         4002         Ca         4002         Gd         4002         In           Ba         4002         Ca         4002         Gd         4002         In           Bi         4002         Ca         4002         Gd         4002         In           Bi         4002         Ca         4002         Ge         4002         In           Bi         4002         Ca         4002         Ge         4002         In           Bi         4002         Ca         4002         Ge         4002         La           Bi         4002         Ca         4002         An         4002         Hb                                                                                                                                                                                                                                  |            | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutiestandards.com                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 2 01 2                          | <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standard.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All Standards broud by stoud with cases tight and under appropriate laboratory conditions.</li> <li>* All Standards are prepared with cases tight and under appropriate laboratory conditions.</li> <li>* Mucertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).</li> </ul> | this standard.                                                                  |                            | ADJ2         Li         T         Nb         ADJ2         Fr         ADJ2         Ab         ADJ2         Fr         ADJ2         Ab         ADJ2         Fr         ADJ2         F         ADJ2 | 1/Br/) SW- | Mass Spectrometry (ICP-MS):                                                     | Certified Reference Material CRM                                                         |
| Printed: 6/24/2024, 11:20:08 PM | Ъ.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Sur P. S.                                                                       | Certified by:              | Set         40.2         Th         40.02         U         40.02           Si         40.02         Tr         40.02         U         40.02           Ag         40.02         Tr         40.02         V         40.02           Na         40.2         Tr         40.02         V         40.02           Sr         40.02         Tr         40.02         Y         40.02           Sr         40.02         Tr         40.02         Y         40.02           Ta         40.02         Tr         40.02         Y         40.02           Ta         40.02         Tr         40.02         Y         40.02           Ta         40.02         Tr         40.02         Zr         40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |                                                                                 | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

Page 1 of 4

ក<sup>08</sup> = ក្រុងអាស់ ដែល ភ្លេង ភ្ល

Z = 1000BL =  $\sup_{x \in \mathcal{A}} (\pi_x) = O_{CRM/RM} = k \left( u^2_{Char} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{C}_{bb} \right)^{1/2}$  $\mathsf{M}^{i} = (1/\mathsf{n}^{\mathsf{clust}\,i})^{\Sigma} \setminus (\Sigma(1/(\mathsf{n}^{\mathsf{clust}\,i})_{\Sigma})$ 

nieneity standard uncertain ucherts mort arone enti = a fanta lisnegomort ettod, of ettod = dd<sup>u</sup> adnere vitidats mot gnot = <sub>ad</sub>t  $\label{eq:spinor} \min \left\{ x \right\} = U_{CRM/RM} = k \left\{ u^2_{char} * u^2_{bb} + u^2_{bb} + u^2_{bb} + u^2_{bb} \right\}^{4}$ 

$$\begin{split} \chi_{CRM,FRM} = & (\chi_{o}) \; (u_{char, o}) \\ \chi_{a} = mean of Assay Method A with ut and a charter of the standard uncertainty of uncertainty of the standard uncertainty$$

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mean of individual results:

Certified Value, X<sub>CRMMM</sub>, where two or more methods of characterization are used is the weighted mean of the results: Characterization of CRM/RM by One Method Characterization of CRM/RM by Two or More Methods

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent to following equations are used in the calculate/K=2.

traceability. - The Calculated Value is a value calculated from the weight of a starting material that has been cartified idrectly vs. A National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance starting.

ICP Assay NIST SRM 3162a Lot Number: 130925 1002 ± 4 hg/mL

Pssay Method #1

g = Jojoej

un pepuedra w

(1x) (1w) = X(wi) (xi)

:noiternotnl ysseA

1.012 g/mL (measured at 20 ± 4 °C) Density: 1002 ± 5 µg/mL sulsV beitified

 $\chi_q = mean of Assay Method I with standard uncertainty updat 1$ w<sub>1</sub> = the weighting factors for each method calculated using the the transmission of the standard s

**CERTIFIED VALUES AND UNCERTAINTIES** 3.0

Starting Material Purity: 99.9975% Starting Material Lot#: 2094 Starting Material: In Metal unineti T 1 000 hg/mL ea: :(s)ətylanA \ əulsV :xinteM

tr. HF 2% (v/v) HNO3 27991717-2T Lot Number: **LITED** Catalog Number: Product Code:

Single Analyte Custom Grade Solution

PRODUCT DESCRIPTION 0.S

Number QSR-1034).

the Competence of Reference Material Producers" and ISO/IEC 17025, "Ceneral Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Vantures is also an ISO 9001 registered manufacturer (QSR Certificate Inorganic Manuel 2014) INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for



ACCREDITATION / REGISTRATION 0.r

300 Technology Drive Christiansburg, VA 24073 USA Christiansburg, VA 24073

R:2/22/24

info@inorganicventures.com E: 240-282-3015 E: 240-282-3030

Refine your results. Redefine your industry. Certificate of Analysis 6657 'SLEST

# 4.0 TRACEABILITY TO NIST

sbecueq. - This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRMRM uncertainty error and the measurement, weighing and volume dilutiton errors. In rare cases where no NIST SRMRM are available, the term "in-house std.' is a provided.

# 4.1 Thermometer Calibration

laboratory. - All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration

# 4.2 Balance Calibration

used for testing are annually compared to master weights and are traceable to NIST. - All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights

# 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

# 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

.my €.0 a2 M 0732£0.0 > ⊨N O 832000.0 > ⊔∃ M 8€2000.0 > ⊵A M ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to CRMRMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS, were analyzed in an up of the method for each element of the property effection of the method for the met

|          |   |    |        |       |   |    |   |            |   |    | - |          |   |    | • |          |   |            |   |
|----------|---|----|--------|-------|---|----|---|------------|---|----|---|----------|---|----|---|----------|---|------------|---|
|          |   |    | 9890   | 00.00 | > | ٩٨ | Μ | 0.004900.0 | > | эS | 0 | Þ77000.0 |   | oM | Ν | 892000.0 | > | ΞL         | M |
|          |   |    | 9412   | 00.00 | > | X  | Μ | 926900.0   | > | qs | Μ | 0.003267 | > | υM | 0 | 892000.0 | > | DÀ         | M |
|          |   |    | 67473  | 0.00  |   | M  | Μ |            | > | S  | 1 | 0.005445 | > | БM | 0 | 068010.0 | > | ng         | 0 |
|          |   |    | 5586   | 0.01  | > | Λ  | Μ | 0.000269   | > | nЯ | Μ | 0.000268 | > | nŋ | Μ | 0.000268 | > | sÖ         | W |
|          |   |    | 8920   | 0.00  | > | Π  | Μ | 892000.0   | > | ЧЫ | Μ | 0.027225 | > | П  | 0 | 297000.0 |   | CL         | M |
|          |   |    | 8920   | 00.00 | > | шŢ | M | 89Z000.0   | > | əЯ | Μ | 0.000268 | > | F۵ | W | 0.004293 | > | 00         | M |
|          |   |    | 8920   | 00.00 | > | LL | Μ | 0.000268   | > | ЧЯ | Μ | 271100.0 |   | К  | W | 0.000268 | > | 9 <u>0</u> | M |
|          |   |    |        |       | > | Ш  | S | 0.000536   | > | Ъł | Μ | 69Z000.0 | > | 4  | Μ | 0.000268 | > | PO         | M |
|          |   |    | 8998   | 90.05 | > | 41 | Μ | 0.000268   | > | Ч  | Μ | 0.002683 | > | uj | Μ | 929000.0 |   | сa         | 0 |
|          |   |    | 1341   |       | > | θT | Μ | 0.000268   | > | Pd | Μ | 0.000268 | > | ен | Μ | 609100.0 | > | B          | M |
|          |   |    | 8920   |       | > | ЧT | Μ | £70100.0   | > | ЬΡ | Μ | 0.003231 | > | бн | Μ | 0.005366 | > | вe         | M |
|          |   |    | 0990   | 10.0  |   | БT | Μ | 0.054450.0 | > | Ь  | 0 | 191200.0 |   | Ήł | Μ | 0.002683 | > | Вa         | M |
|          |   |    | 9600   | 00.0  |   | ٦S | 0 | 0.000269   | > | sO | Μ | 0.002146 | > | 99 | Μ | 0.008929 | > | В          | 0 |
|          |   |    | 9600   | 00.0  |   | us | Μ | 068010.0   | > | !N | 0 | 0.000268 | > | ΡÐ | Μ | 778400.0 | > | n∀         | M |
|          |   |    | 8920   | 00.0  | > | ws | Μ | 0.000268   | > | PN | Μ | 0.000268 | > | БÐ | Μ | 985800.0 | > | sA         | M |
| 0.043560 | > | ۶Z | 0 SE74 |       |   | !S | 0 | 0.043560   | > | ٩N | 0 | 0.003225 |   | θ٦ | 0 | 278000.0 |   | IA         | 0 |
| 792600.0 | > | uΖ | 1204 O | 00.0  |   | θS | Μ | 0.032670   | > | вN | 0 | 0.000268 | > | nЭ | Μ | 0.000536 | > | £∀         | M |
|          |   |    |        |       |   |    |   |            |   |    |   |          |   |    |   |          |   |            |   |

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

- For the calibration of analytical instruments and validation of analytical methods as appropriate. 9.0 INTENDED USE

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Page 2 of 4

# Page 3 of 4

- Chemical Testing - Accredited / A2LA Certificate Number 883.01 "serveter of the second sec

- QSR Certificate Number QSR-1034

nottertizigeA metevs inemegeneM villsuD 100e OSI 1.01

# **WOITATNEMUDOD GRADNATS YTILAUD**

### 0.01

Homogeneity data indicate that the end user should take a minimum server of 0.2 m L or 2.0 m L or 2 - This solution was more according to the superior superior of the form as the solution of the homogeneous. المستحدم المرابعة الم .viienegeneity.

Please refer to the Safety Data Sheet for information regarding this CRMRM. HOMOGENEITY 0'6

## NOITAMAORNI SUOGAASAH 0.8

| M, Mo, Co<br>Mb, Tã, Cr, U<br>(Mhere X = Zr, Mo,<br>tatat, 7N2, 366A=Z<br>14N17N2, 366A=Z<br>14N17N2, 366A=Z<br>14N17N2, 366A=ZC,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N16O2180,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N170,<br>14N17 | 'SSB(G L<br>L<br>L | 0.0054 / 0.00092 باي(mL<br>1.0054 / 0.00092 باي(mL<br>1.0000.0 / 0.00034 باي(mL<br>1.00053 / 0.0000.0 / 1.0000<br>1.000000 / 1.000000 / 1.0000000000000000 | CP-OES 323.452 nm<br>(CP-OES 334.941 nm<br>(CP-OES 334.941 nm<br>(CP-OES 336.121 nm<br>(CP-OES 336.121 nm<br>(CP-OES 336.121 nm<br>(CP-OES 336.121 nm<br>(CP-OES 336.121 nm<br>(CP-OES 336.121 nm)<br>(CP-OES 34.121 nm)<br>(CP-OES 34.121 nm)<br>(CP-OES 34.121 nm)<br>(CP-OES 34.121 nm) |
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| St Interferences (underlined indicates severe)<br>325160, 32514N,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Orde<br>A/N        | 14 ppt                                                                                                                                                     | ICP-MS 48 amu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view): **Technique/Line** 

1:1:1 H2O / HF / H2SO4 or fuse ash with pyrosultate it oxide is as plastic pigment and likely in prookite Notentity: Oxde - low temperature history and sortanty - ineer (sortant in 122) in source heads Notentity: Oxde - low temperature history (-800EC) brookite (fuse in Pto with KS2207); Ores (f TI Containing Samples (Preparation and Solution) - Metal (Soluble in H2O / HF caution -powder reacts violentino: Ovide , Iour Inergene , or entile (Discoluted by Inergene) and Ferdinal Market (Soluble In 1997).

HINGS / LOPE corporations of an LOPE contained, while all solutions as the TI(F)6-2 chemically stable for years in HNOS / Lope container. 1-10,000 ppm single element solutions as the TI(F)6-2 chemically stable for years in TI Containing American and Solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. with a fendency to hydrolyze forming the hydrafied oxide in all dilute acids except HF. **Stability -** 2-100 ppb levels stable (Alone or mixed with all other metals) as the Ti(F)6-2 for months in 1% HNO3 / LDPE container. 1-10.000 point and element solutions as the Ti(F)6-2 chemically stable for year media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of thansition elements unless they are fluorinated). Stable with more inorganic anions with a tendency to hydrolyze forming the hydrafed oxide in all dilute acids except HF. Chemical Compatibility - Soluble in concentrated HCI, HF, H3PO4 H2SO4 and HVO3. Avoid neutral to basic S-8(T)T 6 4+ 78.74 - noiluite in Solution (Chemical Form in Solution - 47.74 6 T(F)6-5-- For more information, visit www.inorganicventures.com/TCT Afomic Weinher Valence: Coordination Winnher: Chemical Equa

reported density. Do not pipette from the container. Do not return removed aliquots to container. - After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the renorted density. To not other from the container. To not return removed alternots to container.

Page some more served to the served to the served to the organization of the concentration(s). It is be the responsibility of the user to account for this effect. When the bottle is weighed both before and after being the responsibility of the user to account for this effect. When the bottle is weighed both before and after being the rescaled to the test to account for this effect. When the bottle is weighed both before and after being the rescaled to the test to account for this effect. When the bottle is weighed both before and after being the rescaled to the test to account for this effect. When the bottle is the active the bottle is the rescaled to the test to account for the test to account to the test to account the test to account to test to account to account to the test to test to acc - While stored in the sealed TCT bag, transpiration of this CRAWRM is negligible. After opening the sealed TCT had transmission of the CDMMAN will occur recutification increase in the source concentration of the is

- Store between approximately 4° - 30° C while in sealed TCT bag.

Page 4 of 4

Certifying Officer:

Chairman / Senior Technical Director

201928

Paul Gaines

-

Thomas Kozikowski Manager, Quality Control

Certificate Approved By:

0.2r

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7,1.

- Sealed TCT Bag Open Date:

11.3 Period of Validity stability studies conducted on property stored and handled CR/WRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

- The lot expiration date reflects the period of time that the stability of a CRMMM can be supported by long term

- The date after which this CRM/RM should not be used.

- June 17, 2027

11.2 Lot Expiration Date

The cartification is valid within the measurement uncertainty specified provided the CRWRM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

June 17, 2022

11.1 Certification Issue Date

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 0.11

norganic Ventures, 300 Technicky Drive, Christianeburg, Ve. 24073, USA; Telephone: 800,669,678; 540,585,3030, Fax: 540,562,5015; Innegan

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

| ADSOIUTE STANDARDS, INC.<br>800-368-1131<br>www.absolutestandards.com      |                                                 |                                       | U                      | ertified I                                                                | Referent  | ce Matei               | Certified Reference Material CRM | C                       | 1117                                   |            | •                                                                                 | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>ttps://Absolutestandards.com | ccredited<br>Number<br>trds.com |
|----------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------|------------------------|---------------------------------------------------------------------------|-----------|------------------------|----------------------------------|-------------------------|----------------------------------------|------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------|
| הבסדובובה שובותוםד מבססמד.                                                 |                                                 |                                       |                        |                                                                           |           |                        | 4                                |                         | 20                                     | 121        |                                                                                   |                                                                                          |                                                                                         |                                 |
| CENTRIED WEIGHT NELON.<br>Part Number:<br>Lot Number:                      | <u>57038</u><br>031524                          |                                       |                        | Solvent:                                                                  |           | 24002546               | Nitric Acid                      |                         |                                        |            | 1                                                                                 |                                                                                          |                                                                                         |                                 |
| Description:                                                               | Strontium (Sr)                                  | (Sr)                                  |                        |                                                                           | P %C      | 40.0                   | Nitric Acid                      |                         | Formulated Rv                          | d By       | Bancon Chan                                                                       | te energiese                                                                             | 031524                                                                                  |                                 |
| Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): | 031527<br>Ambient (20 °C)<br><b>1000</b>        | (C)                                   |                        |                                                                           |           |                        |                                  |                         |                                        | n n n      | Henry                                                                             | La                                                                                       | 100                                                                                     |                                 |
| NIST Test Number:                                                          | 6UTB                                            |                                       | 5E-05 B                | 5E-05 Balance Uncertainty                                                 | linty     |                        |                                  |                         | Reviewed By:                           | By:        | Pedro L. Rentas                                                                   | 8<br>S                                                                                   | 031524                                                                                  |                                 |
| Weight shown below was diluted to (mL):<br>Lot<br>Compound RM# Number      | <b>Is diluted to (mL):</b><br>Lot<br>RM# Number | 2000.07<br>Nominal<br>Conc. (µg/mL)   | 0.100<br>Purity<br>(%) | 0.100 Flask Uncertainty<br>Purity Uncertainty Assay<br>(%) Purity (%) (%) | say<br>() | Target<br>Weight (g) V | Actual<br>Weight (g) C           | Actual<br>Conc. (µg/mL) | Expanded<br>Uncertainty<br>+/- (µg/mL) | CAS        | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LDS | SDS Information<br>Safety Info. On Attached<br>SHA PEL (TWA)                             | d pg.)<br>LDSO                                                                          | NIST<br>SRM                     |
| 1. Strontium nitrate (Sr)                                                  | IN017 SRZ022018A1                               | 1000                                  | 68.997                 | 0.10                                                                      | 41.2 4.6  | 4.85470                | 4.85502                          | 1000.1                  | 2.0                                    | 10042-76-9 | NA                                                                                | orl-ra                                                                                   | ori-rat >2000mg/kg 3153a                                                                | 3153a                           |
| 5.0E6                                                                      | -                                               | 14.495 sec]:58138.D# [Count] [Linear] | ec]:581                | 38.D#[                                                                    | Count     | [Linear]               |                                  |                         |                                        |            |                                                                                   |                                                                                          |                                                                                         |                                 |
|                                                                            |                                                 |                                       |                        |                                                                           |           |                        |                                  |                         |                                        |            |                                                                                   |                                                                                          |                                                                                         |                                 |
| 9.2EG                                                                      |                                                 |                                       |                        |                                                                           |           |                        |                                  |                         |                                        |            | ~~~~ de sense verser en de la de la                                               |                                                                                          |                                                                                         |                                 |
| m/z->-                                                                     | 10 20                                           | 0                                     |                        | 40                                                                        | 20        | 0                      | 80                               | 20                      |                                        | 08         | - <mark>0</mark><br>3                                                             | 100                                                                                      |                                                                                         |                                 |
| 5.0亩8                                                                      |                                                 |                                       |                        |                                                                           |           |                        |                                  |                         |                                        |            |                                                                                   |                                                                                          |                                                                                         |                                 |
|                                                                            |                                                 | 5.<br>                                | 1                      |                                                                           | 99<br>-   |                        |                                  |                         |                                        |            | ŕ                                                                                 |                                                                                          |                                                                                         |                                 |
| 5.0E6                                                                      | 110 120                                         | 130                                   | 0                      | 40                                                                        | 150       | Q                      | 160                              | 170                     |                                        | 180        | 180                                                                               | 000                                                                                      |                                                                                         |                                 |
|                                                                            |                                                 |                                       |                        |                                                                           |           |                        |                                  |                         |                                        |            |                                                                                   |                                                                                          |                                                                                         |                                 |
| 2.5EG                                                                      |                                                 |                                       |                        |                                                                           |           |                        |                                  |                         |                                        |            |                                                                                   |                                                                                          |                                                                                         |                                 |
| m/z->> 210                                                                 | 520                                             | 230                                   | 0                      | 240                                                                       | 250       | 0                      | 260                              |                         |                                        |            |                                                                                   |                                                                                          |                                                                                         |                                 |
|                                                                            |                                                 |                                       |                        |                                                                           |           |                        |                                  |                         |                                        |            |                                                                                   |                                                                                          |                                                                                         |                                 |
| oart # 57038 Lot # 031524                                                  |                                                 |                                       |                        |                                                                           | -         | 1 of 2                 |                                  |                         |                                        | Pri        | Printed: 6/7/2024, 3:58:42 PM                                                     | 4, 3:58:42 P                                                                             | W                                                                                       |                                 |

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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|    |       |    |        |          |                   |              | Trace M           | letals | Verification       | ation    | by ICP-MS    |              | (ng/mL)                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
|----|-------|----|--------|----------|-------------------|--------------|-------------------|--------|--------------------|----------|--------------|--------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
|    |       |    | 四本派出出建 | ALCON ST | The second second | ACCOUNTED IN | and states in the |        | Man Landson Martin |          | A DAMAGE AND | <b>MARCH</b> | A NUMBER OF STREET, ST | Contraction of the local division of the loc | United in the second | Self-pice | Compare and the second s |                | States and the |
| N  | ≪0.02 | 3  | <0.02  | Â        | <0.02             | Hf           | <0.02             | Ľ      | <0.02              | ī        | <0.02        | Ł            | <0.02                                                                                                          | Se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ⊲0.2                 | P.        | <b>40.02</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | M              | 2002           |
| Sb | <0.02 | ű  | <0.2   | 田        | €0.02             | Ho           | <0.02             | Ľ      | <0.02              | q        | <0.02        | Re           | <0.02                                                                                                          | Si                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <0.02                | Je        | <0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | =              | 200            |
| As | <0.2  | ථ  | <0.02  | Ē        | <0.02             | ä            | <0.02             | Mg     | ±0.0               | ő        | <0.02        | Rh           | <0.02                                                                                                          | Ag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <0.02                | F         | <0 0>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | >              | 89             |
| Ba | <0.02 | ű  | <0.02  | 3        | €0.02             | ч            | <0.02             | Mn     | <0.02              | Ρd       | <0.02        | Rb           | <0.02                                                                                                          | ž                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <0.2                 | É         | 2007                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | - <del>5</del> |                |
| Be | <0.01 | ບັ | <0.02  | පී       | <0.02             | Ъе           | 40.2              | Не     | <0.2               | Þ        | 20.02        | Ř            | 20.02                                                                                                          | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ļ F                  | ļ         | 10.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2 >            |                |
| Bi | <0.02 | රී | <0.02  | ථ        | €0.02             | La           | <0.02             | Mo     | 40.02              | ġ.       | 2000         |              |                                                                                                                | 5 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | - 6            | 20.02          |
| æ  | <0.02 | õ  | <0.02  | Au       | <b>40.02</b>      | å            | <0.02             | PZ     | <0.02              | ž        | 202          | 3            | 10.02                                                                                                          | ¢ ا                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      | 5 F       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5              | 20.05          |
|    |       |    |        |          |                   |              |                   |        |                    |          |              |              | 1000                                                                                                           | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 70.02                | Ŧ         | 70.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5              | 20.02          |
|    |       |    |        |          |                   |              |                   |        |                    | 1000 400 |              |              |                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
|    |       |    |        |          |                   |              |                   |        | (1) = 1 and $e(1)$ | get ana. | iyre         |              |                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |

# **Physical Characterization:**

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

Sur ?

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in

the preparation of all standards.

All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

- E. 5 \* 2962 246 146 **4**• . 12 M 8: 2 r<sup>1</sup>a€<sup>1</sup># \*:

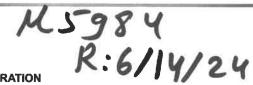
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## **Certificate of Analysis**

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#### 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

#### 2.0 PRODUCT DESCRIPTION

| Product Code:             | Single Analyte Custom Grade Solution |
|---------------------------|--------------------------------------|
| Catalog Number:           | CGY10                                |
| Lot Number:               | V2-Y740548                           |
| Matrix:                   | 2% (v/v) HNO3                        |
| Value / Analyte(s):       | 10 000 µg/mL ea:<br>Yttrium          |
| Starting Material:        | Yttrium Oxide                        |
| Starting Material Lot#:   | 2661 and 06230520YL                  |
| Starting Material Purity: | 99.9984%                             |
| CERTIFIED VALUES          |                                      |

#### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

| Certified Value: | 10000 ± 30 μg/mL                       |
|------------------|----------------------------------------|
| Density:         | 1.032 g/mL (measured at 20 $\pm$ 4 °C) |

Assay Information:

| Assay Method #1 | <b>10011 ± 25 μg/mL</b><br>EDTA NIST SRM 928 Lot Number: 928          |
|-----------------|-----------------------------------------------------------------------|
| Assay Method #2 | <b>9997 ± 50 μg/mL</b><br>ICP Assay NIST SRM 3167a Lot Number: 190730 |
| Assay Method #3 | 9984 ± 31 µg/mL                                                       |

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

Calculated NIST SRM Lot Number: See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

#### Characterization of CRM/RM by Two or More Methods

Certified Value, X<sub>CRWRM</sub>, where two or more methods of characterization are used is the weighted mean of the results:

#### $X_{CRM/RM} = \Sigma(w_i) (X_i)$

- XI = mean of Assay Method i with standard uncertainty uchar i
- $w_i$  = the weighting factors for each method calculated using the inverse square of the variance:
  - $w_i = (1/u_{char})^2 / (\Sigma (1/(u_{char})^2))$

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ 

- k = coverage factor = 2
- $u_{char} = [\Sigma((w_i)^2 (u_{char} i)^2)]^{1/2}$  where  $u_{char} i$  are the errors from each characterization method
- $u_{bb}$  = bottle to bottle homogeneity standard uncertainty  $u_{its}$  = long term stability standard uncertainty (storage)
- uts = transport stability standard uncertainty (stor
- als assister subsity surraise atternal

#### 4.0 TRACEABILITY TO NIST

#### **Characterization of CRM/RM by One Method**

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mean of individual results:

 $X_{CRM/RM} = (X_a) (u_{char a})$   $X_a = mean of Assay Method A with$  $<math>u_{char a} = the standard uncertainty of characterization Method A$ 

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k ( $u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts}$ )<sup>1/2</sup> k = coverage factor = 2 u\_{char a} = the errors from characterization u\_{bb} = bottle to bottle homogeneity standard uncertainty u\_{lts} = long term stability standard uncertainty (storage) u\_{lts} = transport stability standard uncertainty

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

#### 4.1 Thermometer Calibration

 All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

#### **4.2 Balance Calibration**

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

#### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

#### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

| М | Ag | < | 0.004600 | м | Eu |   | 0.009037 | М | Na |   | 0.086360 | М | Se | < | 0.005200 | М | Zn |   | 0.030125 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| М | A  |   | 0.014862 | 0 | Fe |   | 0.002410 | М | Nb | < | 0.000570 | ο | Si |   | 0.024100 | 0 | Zr | < | 0.002600 |
| М | As | < | 0.003500 | м | Ga | < | 0.000570 | м | Nd |   | 0.000923 | М | Sm |   | 0.000461 |   |    |   |          |
| М | Au | < | 0.001700 | м | Gd | < | 0.003500 | М | Ni | < | 0.005700 | М | Sn | < | 0.002300 |   |    |   |          |
| 0 | в  |   | 0.002209 | м | Ge | < | 0.005200 | М | Os | < | 0.001200 | М | Sr | < | 0.004600 |   |    |   |          |
| 0 | Ва | < | 0.002500 | М | Hf | < | 0.000570 | n | Р  | < |          | М | Та | < | 0.000570 |   |    |   |          |
| 0 | Be | < | 0.001400 | М | Hg | < | 0.000570 | М | Pb |   | 0.005020 | М | Tb |   | 0.001044 |   |    |   |          |
| М | Bi | < | 0.003500 | М | Но |   | 0.009037 | М | Pd | < | 0.005100 | М | Те | < | 0.002300 |   |    |   |          |
| 0 | Са |   | 0.009841 | Μ | In | < | 0.002300 | М | Pr | < | 0.002300 | М | Th | < | 0.000570 |   |    |   |          |
| М | Cd | < | 0.000570 | М | Ir | < | 0.000570 | М | Pt | < | 0.000570 | М | Ti | < | 0.003500 |   |    |   |          |
| М | Се | < | 0.002300 | 0 | к  |   | 0.018677 | М | Rb | < | 0.000570 | М | TI | < | 0.000570 |   |    |   |          |
| М | Со | < | 0.000570 | М | La |   | 0.000461 | М | Re | < | 0.000570 | М | Tm | < | 0.003500 |   |    |   |          |
| М | Cr | < | 0.004000 | 0 | Li | < | 0.009300 | М | Rh | < | 0.008000 | М | U  | < | 0.000570 |   |    |   |          |
| М | Cs | < | 0.000570 | М | Lu |   | 0.000582 | М | Ru | < | 0.000570 | М | V  |   | 0.001265 |   |    |   |          |
| М | Cu |   | 0.002610 | 0 | Mg |   | 0.001486 | n | S  | < |          | М | W  | < | 0.002300 |   |    |   |          |
| М | Dy |   | 0.003815 | М | Mn |   | 0.000582 | М | Sb |   | 0.005422 | s | Y  | < |          |   |    |   |          |
| М | Er |   | 0.003615 | М | Мо | < | 0.005700 | М | Sc | < | 0.001200 | м | Yb |   | 0.001827 |   |    |   |          |
|   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

#### 6.0 INTENDED USE

6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale</u>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

#### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

#### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^\circ - 24^\circ$  C to minimize the effects of transpiration. Use at  $20^\circ \pm 4^\circ$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

#### - For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.91 +3 6 Y(OH)(H2O)x+2 Chemical Compatibility -Soluble in HCl, H2SO4 and HNO3. Avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H2O/ HNO3); Ores (Carbonate fusion in Pt0 followed by HCI dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCI or HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

| Technique/Line     | Estimated D.L.         | Order | Interferences (underlined indicates severe) |
|--------------------|------------------------|-------|---------------------------------------------|
| ICP-MS 89 amu      | 0.8 ppt                | N/A   | 73Ge16O, 178Hf+2                            |
| ICP-OES 360.073 nm | 0.005 / 0.000036 µg/mL | 1     | Ce, Th                                      |
| ICP-OES 371.030 nm | 0.004 / 0.00007 µg/mL  | 1     | Се                                          |
| ICP-OES 377.433 nm | 0.005 / 0.0009 µg/mL   | 1     | Ta, Th                                      |
|                    |                        |       |                                             |

#### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

#### 9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

#### 10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

#### 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

#### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

#### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

#### **11.1 Certification Issue Date**

February 20, 2024

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

#### **11.2 Lot Expiration Date**

- February 20, 2029
- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

#### **11.3 Period of Validity**

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

#### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS **Certificate Prepared By:**

Uyen Truong **Custom Processing Supervisor** 

#### **Certificate Approved By:**

Muzzammil Khan Stock Laboratory Supervisor

Mayn menny Mayyni Kh Paul R Laina

#### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director



## **Certificate of Analysis**

Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



#### 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034). P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com



#### 2.0 PRODUCT DESCRIPTION

| Product Code:             | Single Analyte Custom Grade Solution |
|---------------------------|--------------------------------------|
| Catalog Number:           | CGIN10                               |
| Lot Number:               | U2-IN729349                          |
| Matrix:                   | 5% (v/v) HNO3                        |
| Value / Analyte(s):       | 10 000 μg/mL ea:<br>Indium           |
| Starting Material:        | Indium Metal                         |
| Starting Material Lot#:   | 2511                                 |
| Starting Material Purity: | 99.9995%                             |
| CERTIFIED VALUES AN       | ID UNCERTAINTIES                     |

| Certified Value: | 10022 ± 30 μg/mL                       |
|------------------|----------------------------------------|
| Density:         | 1.044 g/mL (measured at 20 $\pm$ 4 °C) |

Assay Information:

3.0

| Assay Method #1 | <b>10021 ± 56 μg/mL</b><br>ICP Assay NIST SRM 3124a Lot Number: 110516 |
|-----------------|------------------------------------------------------------------------|
| Assay Method #2 | <b>10035 ± 25 µg/mL</b><br>EDTA NIST SRM 928 Lot Number: 928           |
| Assay Method #3 | 10001 ± 33 µg/mL<br>Calculated NIST SRM Lot Number: See Sec. 4.2       |

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

#### Characterization of CRM/RM by Two or More Methods

Certified Value, X<sub>CRMRM</sub>, where two or more methods of characterization are used is the weighted mean of the results:

#### $X_{CRM/RM} = \Sigma(w_i) (X_i)$

- $X_{i}$  = mean of Assay Method I with standard uncertainty  $u_{char i}$ 
  - $\mathbf{w}_{i}$  = the weighting factors for each method calculated using the inverse square of the variance:
    - $w_i = (1/u_{char\,i})^2 / (\Sigma (1/(u_{char\,i})^2)$

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k  $(u^2_{char} + u^2_{bb} + u^2_{1ts} + u^2_{ts})^{1/2}$ k = coverage factor = 2  $u_{char} = [2((w_i)^2 (u_{char} i)^2)]^{1/2}$  where  $u_{char}$  i are the errors from each characterization method

- $\begin{array}{l} \text{construction} \quad \text{con$
- uts = transport stability standard uncertainty

#### 4.0 TRACEABILITY TO NIST

#### Characterization of CRM/RM by One Method

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mean of individual results:

$$\begin{split} \chi_{CRM/RM} = (X_n) \, (u_{cher\ n}) \\ \chi_n = mean\ of\ Assay\ Method\ A\ with \\ u_{cher\ n} = the\ standard\ uncertainty\ of\ characterization\ Method\ A \end{split}$$

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k (u<sup>2</sup><sub>cher</sub> a + u<sup>2</sup><sub>bb</sub> + u<sup>2</sup><sub>Hs</sub> + u<sup>2</sup><sub>ts</sub>)<sup>½</sup> k = coverage factor = 2 u<sub>char</sub> a = the errors from characterization u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty u<sub>fts</sub> = long term stability standard uncertainty (storage) u<sub>tt</sub> = transport stability standard uncertainty

 This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

#### 4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

#### 4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

#### 4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

#### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

| М | Ag | < | 0.000760 | М | Eu   | < | 0.000760 | 0 | Na |   | 0.012771 | М | Se | < | 0.023000 | М | Zn | < | 0.006100 |
|---|----|---|----------|---|------|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| М | AI |   | 0.003385 | 0 | Fe   |   | 0.004462 | М | Nb | < | 0.000760 | 0 | Si |   | 0.024619 | М | Zr | < | 0.000760 |
| М | As | < | 0.004600 | М | Ga   | < | 0.000760 | М | Nd | < | 0.000760 | М | Sm | < | 0.000760 |   |    |   |          |
| М | Au | < | 0.002300 | М | Gd   | < | 0.000760 | 0 | Ni | < | 0.005100 | М | Sn | < | 0.000760 |   |    |   |          |
| 0 | в  |   | 0.003692 | М | Ge   | < | 0.001600 | м | Os | < | 0.000760 | 0 | Sr | < | 0.000610 |   |    |   |          |
| М | Ba | < | 0.001600 | М | Hf   | < | 0.000760 | n | Р  | < |          | М | Та | < | 0.000760 |   |    |   |          |
| 0 | Be | < | 0.000130 | М | Hg   | < | 0.003100 | М | Pb |   | 0.001400 | М | Tb | < | 0.000760 |   |    |   |          |
| Μ | Bi | < | 0.000760 | М | Ho   | < | 0.000760 | Μ | Pd | < | 0.001600 | М | Те | < | 0.000760 |   |    |   |          |
| 0 | Ca |   | 0.004616 | 5 | In   | < |          | М | Pr | < | 0.000760 | М | Th | < | 0.000760 |   |    |   |          |
| Μ | Cd | < | 0.000760 | М | lr – | < | 0.000760 | М | Pt | < | 0.000760 | 0 | Π  | < | 0.001100 |   |    |   |          |
| М | Се | < | 0.000760 | 0 | к    |   | 0.007078 | М | Rb | < | 0.000760 | М | ТΙ | < | 0.000760 |   |    |   |          |
| М | Со | < | 0.000760 | М | La   | < | 0.000760 | М | Re | < | 0.000760 | M | Tm | < | 0.000760 |   |    |   |          |
| 0 | Cr | < | 0.001300 | 0 | Li   | < | 0.000130 | М | Rh | < | 0.000760 | М | U  | < | 0.000760 |   |    |   |          |
| М | Cs | < | 0.000760 | М | Lu   | < | 0.000760 | М | Ru | < | 0.000760 | М | V  | < | 0.001600 |   |    |   |          |
| М | Cu | < | 0.003800 | 0 | Mg   |   | 0.000707 | n | s  | < |          | М | W  | < | 0.001600 |   |    |   |          |
| М | Dy | < | 0.000760 | 0 | Mn   |   | 0.000149 | М | Sb | < | 0.000760 | М | Y  | < | 0.000760 |   |    |   |          |
| М | Er | < | 0.000760 | М | Мо   | < | 0.002300 | М | Sc | < | 0.000760 | М | Yb | < | 0.000760 |   |    |   |          |
|   |    |   |          |   |      |   |          |   |    |   |          |   |    |   |          |   |    |   |          |

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

#### 6.0 INTENDED USE

6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM<sup>™</sup>) see the Limited License to Use PCRM<sup>™</sup> in the Inorganic Ventures <u>Terms and Conditions of Sale</u>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM<sup>™</sup> certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

#### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

#### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^\circ$  -  $24^\circ$  C to minimize the effects of transpiration. Use at  $20^\circ \pm 4^\circ$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 114.82 +3 6 ln(H2O)6+3 Chemical Compatibility -Soluble in HCl, HNO3, and H2SO4. Avoid neutral and basic media. Stable with most metals and inorganic anions. The oxalate, sulfide, carbonate, hydroxide and phosphate are insoluble in water.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

In Containing Samples (Preparation and Solution) -Metal (Best dissolved in HCI / HNO3); Oxide (Soluble in mineral acids); Ores (Carbonate fusion in Pt0 followed by HCI dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in dilute HCI).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

| Technique/Line     | Estimated D.L.     | Order | Interferences (underlined indicates severe) |
|--------------------|--------------------|-------|---------------------------------------------|
| ICP-MS 115 amu     | 1 ppt              | n/a   | 115Sn, 99Ru16O                              |
| ICP-OES 158.583 nm | 0.05 / 0.002 µg/mL | 1     |                                             |
| ICP-OES 230.606 nm | 0.1 / 0.03 µg/mL   | 1     | Ni, Os                                      |
| ICP-OES 325.609 nm | 0.2 / 0.05 µg/mL   | 1     | Mn, Mo, Th                                  |

#### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

#### 9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

#### 10.0 QUALITY STANDARD DOCUMENTATION

#### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

#### 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Callbration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

#### 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; Inorganicventures.com; info@inorganicventures.com

#### 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

#### **11.1 Certification Issue Date**

February 21, 2023

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

#### **11.2 Lot Expiration Date**

#### - February 21, 2028

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

#### **11.3 Period of Validity**

- Sealed TCT Bag Open Date:

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

#### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

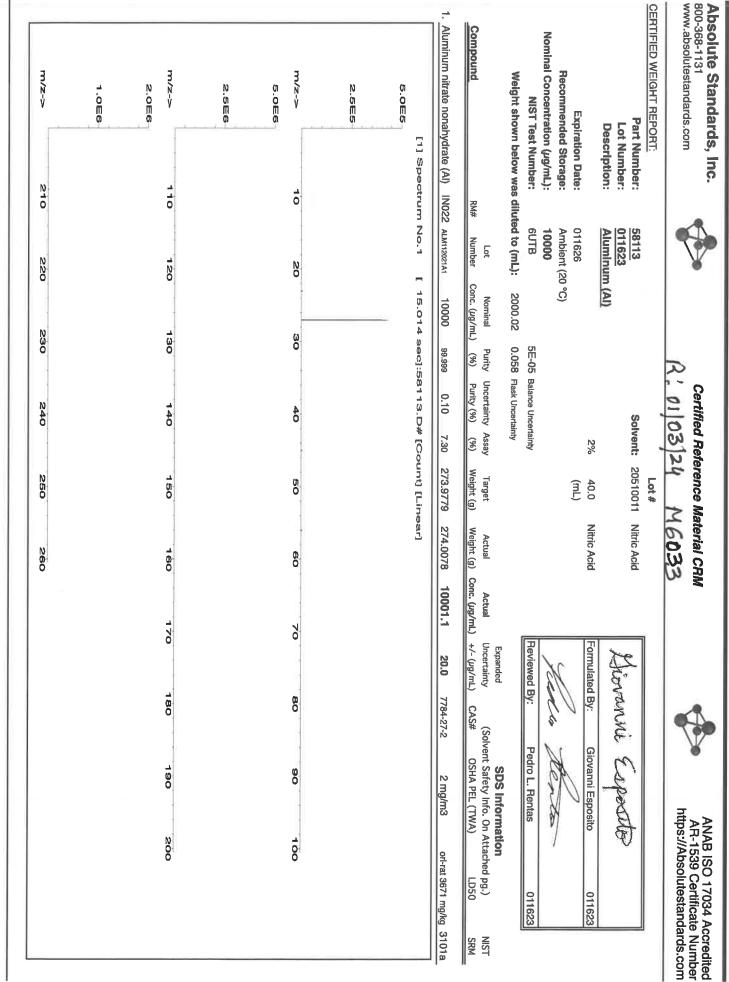
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#### **Certifying Officer:**

**Paul Gaines** Chairman / Senior Technical Director



1 of 1

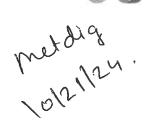


Hydrochloric Acid, 36.5–38.0% , BAKEŘ INSTRA-ANALYZED® Reagent For Trace Metal Analysis









Material No.: 9530-33 Batch No.: 24D1562005 Manufactured Date: 2024-03-18 Retest Date: 2029-03-17 Revision No.: 0

## Certificate of Analysis

| Test                                      | Specification | Result      |
|-------------------------------------------|---------------|-------------|
| ACS – Assay (as HCl) (by acid-base titrn) | 36.5 - 38.0 % | 37.6 %      |
| ACS – Color (APHA)                        | ≤ 10          | 5           |
| ACS – Residue after Ignition              | ≤ 3 ppm       | < 1 ppm     |
| ACS - Specific Gravity at 60°/60°F        | 1.185 - 1.192 | 1.192       |
| ACS – Bromide (Br)                        | ≤ 0.005 %     | < 0.005 %   |
| ACS – Extractable Organic Substances      | ≤ 5 ppm       | < 1 ppm     |
| ACS – Free Chlorine (as Cl2)              | ≤ 0.5 ppm     | < 0.5 ppm   |
| Phosphate (PO4)                           | ≤ 0.05 ppm    | 0.03 ppm    |
| Sulfate (SO4)                             | ≤ 0.5 ppm     | < 0.3 ppm   |
| Sulfite (SO3)                             | ≤ 0.8 ppm     | 0.3 ppm     |
| Ammonium (NH4)                            | ≤ 3 ppm       | < 1 ppm     |
| Trace Impurities – Arsenic (As)           | ≤ 0.010 ppm   | < 0.003 ppm |
| Trace Impurities - Aluminum (AI)          | ≤ 10.0 ppb    | < 5.0 ppb   |
| Arsenic and Antimony (as As)              | ≤ 5.0 ppb     | < 3.0 ppb   |
| Trace Impurities – Barium (Ba)            | ≤ 1.0 ppb     | < 1.0 ppb   |
| Trace Impurities - Beryllium (Be)         | ≤ 1.0 ppb     | < 1.0 ppb   |
| Trace Impurities – Bismuth (Bi)           | ≤ 10.0 ppb    | < 10.0 ppb  |
| Trace Impurities – Boron (B)              | ≤ 20.0 ppb    | 2.2 ppb     |
| Trace Impurities – Cadmium (Cd)           | ≤ 1.0 ppb     | < 1.0 ppb   |
| Trace Impurities - Calcium (Ca)           | ≤ 50.0 ppb    | 31.0 ppb    |
| Trace Impurities – Chromium (Cr)          | ≤ 1.0 ppb     | 0.5 ppb     |
| Trace Impurities – Cobalt (Co)            | ≤ 1.0 ppb     | 0.2 ppb     |
| Trace Impurities – Copper (Cu)            | ≤ 1.0 ppb     | < 0.1 ppb   |
| Trace Impurities – Gallium (Ga)           | ≤ 1.0 ppb     | < 0.2 ppb   |
| Trace Impurities – Germanium (Ge)         | ≤ 3.0 ppb     | < 2.0 ppb   |
| Trace Impurities - Gold (Au)              | ≤ 4.0 ppb     | < 0.2 ppb   |
| Heavy Metals (as Pb)                      | ≤ 100 ppb     | < 50 ppb    |
| Trace Impurities – Iron (Fe)              | ≤ 15 ppb      | 3 ppb       |
|                                           |               |             |

>>> Continued on page 2 >>>

Hydrochloric Acid, 36.5-38.0% BAKER INSTRA-ANALYZED® Reagent For Trace Metal Analysis





#### Material No.: 9530-33 Batch No.: 24D1562005

| Test                                                   | Specification    | Result     |  |  |  |
|--------------------------------------------------------|------------------|------------|--|--|--|
| Trace Impurities - Lead (Pb)                           | ≤ 1.0 ppb        | < 0.2 ppb  |  |  |  |
| Trace Impurities - Lithium (Li)                        | ≤ 1.0 ppb        | < 0.1 ppb  |  |  |  |
| Trace Impurities – Magnesium (Mg)                      | ≤ 10.0 ppb       | 2.2 ppb    |  |  |  |
| Trace Impurities – Manganese (Mn)                      | ≤ 1.0 ppb        | < 0.2 ppb  |  |  |  |
| Trace Impurities – Mercury (Hg)                        | ≤ 0.5 ppb        | < 0.1 ppb  |  |  |  |
| Trace Impurities – Molybdenum (Mo)                     | ≤ 10.0 ppb       | < 5.0 ppb  |  |  |  |
| Trace Impurities – Nickel (Ni)                         | $\leq$ 4.0 ppb   | 0.2 ppb    |  |  |  |
| Trace Impurities – Niobium (Nb)                        | ≤ 1.0 ppb        | < 0.2 ppb  |  |  |  |
| Trace Impurities – Potassium (K)                       | ≤ 9.0 ppb        | < 1.0 ppb  |  |  |  |
| Trace Impurities - Selenium (Se), For Information Only |                  | < 1.0 ppb  |  |  |  |
| Trace Impurities – Silicon (Si)                        | ≤ 100.0 ppb      | < 10.0 ppb |  |  |  |
| Trace Impurities – Silver (Ag)                         | ≤ 1.0 ppb        | < 0.3 ppb  |  |  |  |
| Trace Impurities – Sodium (Na)                         | $\leq$ 100.0 ppb | 2.0 ppb    |  |  |  |
| Trace Impurities – Strontium (Sr)                      | ≤ 1.0 ppb        | < 0.2 ppb  |  |  |  |
| Trace Impurities – Tantalum (Ta)                       | $\leq$ 1.0 ppb   | < 0.9 ppb  |  |  |  |
| Trace Impurities - Thallium (TI)                       | ≤ 5.0 ppb        | < 2.0 ppb  |  |  |  |
| Trace Impurities - Tin (Sn)                            | ≤ 5.0 ppb        | < 0.4 ppb  |  |  |  |
| Trace Impurities – Titanium (Ti)                       | $\leq$ 1.0 ppb   | 0.2 ppb    |  |  |  |
| Trace Impurities - Vanadium (V)                        | ≤ 1.0 ppb        | < 0.2 ppb  |  |  |  |
| Trace Impurities – Zinc (Zn)                           | $\leq$ 5.0 ppb   | < 0.2 ppb  |  |  |  |
| Trace Impurities – Zirconium (Zr)                      | ≤ 1.0 ppb        | < 0.1 ppb  |  |  |  |
|                                                        |                  |            |  |  |  |

Hydrochloric Acid, 36.5-38.0% BAKER IÑSTRA-ANALYZED® Reagent For Trace Metal Analysis



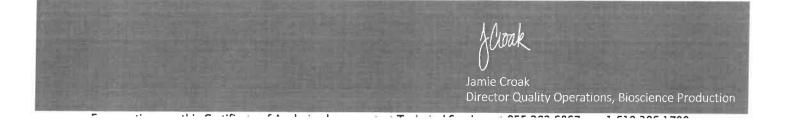


Material No.: 9530-33 Batch No.: 24D1562005

| Test | Specification | Result |  |
|------|---------------|--------|--|
|      | -             |        |  |

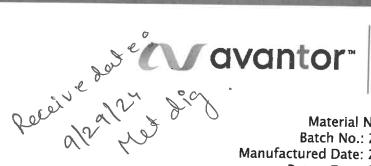
For Laboratory, Research, or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications Storage Condition: Store below 25 °C.

Country of Origin: USA Packaging Site: Phillipsburg Mfg Ctr & DC



Hydrochloric Acid, 36.5-38.0% BAKER INSTRA-ANALYZED® Reagent For Trace Metal Analysis







Material No.: 9530-33 Batch No.: 22F0762009 Manufactured Date: 2022-05-10 Retest Date: 2027-05-09 Revision No.: 0

## Certificate of Analysis

| Test                                      | Specification | Result      |
|-------------------------------------------|---------------|-------------|
| ACS – Assay (as HCI) (by acid-base titrn) | 36.5 - 38.0 % | 37.6 %      |
| ACS – Color (APHA)                        | ≤ 10          | 5           |
| ACS – Residue after Ignition              | ≤ 3 ppm       | < 1 ppm     |
| ACS - Specific Gravity at 60°/60°F        | 1.185 - 1.192 | 1.190       |
| ACS – Bromide (Br)                        | ≤ 0.005 %     | < 0.005 %   |
| ACS – Extractable Organic Substances      | ≤ 5 ppm       | < 1 ppm     |
| ACS – Free Chlorine (as Cl2)              | ≤ 0.5 ppm     | < 0.5 ppm   |
| Phosphate (PO4)                           | ≤ 0.05 ppm    | < 0.03 ppm  |
| Sulfate (SO4)                             | ≤ 0.5 ppm     | < 0.3 ppm   |
| Sulfite (SO3)                             | ≤ 0.8 ppm     | 0.3 ppm     |
| Ammonium (NH4)                            | ≤ 3 ppm       | < 1 ppm     |
| Trace Impurities – Arsenic (As)           | ≤ 0.010 ppm   | < 0.003 ppm |
| Trace Impurities – Aluminum (Al)          | ≤ 10.0 ppb    | 0.8 ppb     |
| Arsenic and Antimony (as As)              | ≤ 5.0 ppb     | < 3.0 ppb   |
| Trace Impurities – Barium (Ba)            | ≤ 1.0 ppb     | < 0.2 ppb   |
| Trace Impurities – Beryllium (Be)         | ≤ 1.0 ppb     | < 0.2 ppb   |
| Trace Impurities – Bismuth (Bi)           | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Boron (B)              | ≤ 20.0 ppb    | < 5.0 ppb   |
| Trace Impurities – Cadmium (Cd)           | ≤ 1.0 ppb     | < 0.3 ppb   |
| Trace Impurities ~ Calcium (Ca)           | ≤ 50.0 ppb    | 14.9 ppb    |
| Trace Impurities – Chromium (Cr)          | ≤ 1.0 ppb     | < 0.4 ppb   |
| Trace Impurities - Cobalt (Co)            | ≤ 1.0 ppb     | < 0.3 ppb   |
| Trace Impurities - Copper (Cu)            | ≤ 1.0 ppb     | < 0.1 ppb   |
| Trace Impurities – Gallium (Ga)           | ≤ 1.0 ppb     | < 0.2 ppb   |
| Trace Impurities – Germanium (Ge)         | ≤ 3.0 ppb     | < 2.0 ppb   |
| Trace Impurities - Gold (Au)              | ≤ 4.0 ppb     | 0.2 ppb     |
| Heavy Metals (as Pb)                      | ≤ 100 ppb     | < 50 ppb    |
| Trace Impurities – Iron (Fe)              | ≤ 15 ppb      | 6 ppb       |
|                                           |               |             |

>>> Continued on page 2 >>>

Hydrochloric Acid, 36.5-38.0% BAKER INSTRA-ANALYZED® Reagent For Trace Metal Analysis





#### Material No.: 9530-33 Batch No.: 22F0762009

| Test                                                   | Specification  | Result    |
|--------------------------------------------------------|----------------|-----------|
| Trace Impurities – Lead (Pb)                           | ≤ 1.0 ppb      | < 0.5 ppb |
| Trace Impurities – Lithium (Li)                        | ≤ 1.0 ppb      | < 0.2 ppb |
| Trace Impurities – Magnesium (Mg)                      | ≤ 10.0 ppb     | 0.8 ppb   |
| Trace Impurities – Manganese (Mn)                      | ≤ 1.0 ppb      | < 0.4 ppb |
| Trace Impurities – Mercury (Hg)                        | ≤ 0.5 ppb      | 0.1 ppb   |
| Trace Impurities – Molybdenum (Mo)                     | ≤ 10.0 ppb     | < 3.0 ppb |
| Trace Impurities - Nickel (Ni)                         | $\leq$ 4.0 ppb | < 0.3 ppb |
| Trace Impurities – Niobium (Nb)                        | ≤ 1.0 ppb      | < 0.2 ppb |
| Trace Impurities – Potassium (K)                       | ≤ 9.0 ppb      | < 2.0 ppb |
| Trace Impurities – Selenium (Se), For Information Only |                | < 1.0 ppb |
| Trace Impurities – Silicon (Si)                        | ≤ 100.0 ppb    | 1.0 ppb   |
| Trace Impurities – Silver (Ag)                         | ≤ 1.0 ppb      | < 0.3 ppb |
| Trace Impurities – Sodium (Na)                         | ≤ 100.0 ppb    | 0.7 ppb   |
| Trace Impurities – Strontium (Sr)                      | ≤ 1.0 ppb      | < 0.2 ppb |
| Trace Impurities – Tantalum (Ta)                       | ≤ 1.0 ppb      | < 0.9 ppb |
| Trace Impurities – Thallium (TI)                       | ≤ 5.0 ppb      | < 2.0 ppb |
| Trace Impurities – Tin (Sn)                            | ≤ 5.0 ppb      | < 0.8 ppb |
| Trace Impurities – Titanium (Ti)                       | ≤ 1.0 ppb      | 0.2 ppb   |
| Trace Impurities - Vanadium (V)                        | ≤ 1.0 ppb      | < 0.2 ppb |
| Trace Impurities – Zinc (Zn)                           | ≤ 5.0 ppb      | 0.8 ppb   |
| Trace Impurities – Zirconium (Zr)                      | ≤ 1.0 ppb      | < 0.1 ppb |
|                                                        |                |           |

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700

Hydrochloric Acid, 36.5–38.0% BAKER INSTRA-ANALYZED® Reagent For Trace Metal Analysis





Material No.: 9530-33 Batch No.: 22F0762009

| Test | Specification | Result |  |
|------|---------------|--------|--|
|      |               |        |  |

For Laboratory, Research, or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications Storage Condition: Store below 25 °C.

Country of Origin: USA Packaging Site: Phillipsburg Mfg Ctr & DC

James Techier

Jamie Ethier Vice President Global Quality

Nitric Acid 69% CMOS



# Receive: a/2a/21 net dig



Material No.: 9606-03 Batch No.: 24B1362001 Manufactured Date: 2024-01-25 Retest Date: 2029-01-23 **Revision No.: 0** 

## Certificate of Analysis

| Test                              | Specification | Result      |  |
|-----------------------------------|---------------|-------------|--|
| Assay (HNO3)                      | 69.0 ~ 70.0 % | 69.6 %      |  |
| Appearance                        | Passes Test   | Passes Test |  |
| Color (APHA)                      | ≤ 10          | 5           |  |
| Residue after Ignition            | ≤ 2 ppm       | < 1 ppm     |  |
| Chloride (Cl)                     | ≤ 0.08 ppm    | < 0.03 ppm  |  |
| Phosphate (PO4)                   | ≤ 0.10 ppm    | < 0.03 ppm  |  |
| Sulfate (SO4)                     | ≤ 0.2 ppm     | < 0.2 ppm   |  |
| Trace Impurities – Aluminum (Al)  | ≤ 40.0 ppb    | < 1.0 ppb   |  |
| Arsenic and Antimony (as As)      | ≤ 5.0 ppb     | < 2.0 ppb   |  |
| Trace Impurities – Barium (Ba)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Beryllium (Be) | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Bismuth (Bi)   | ≤ 20.0 ppb    | < 10.0 ppb  |  |
| Trace Impurities - Boron (B)      | ≤ 10.0 ppb    | < 5.0 ppb   |  |
| Trace Impurities - Cadmium (Cd)   | ≤ 50 ppb      | < 1 ppb     |  |
| Trace Impurities - Calcium (Ca)   | ≤ 50.0 ppb    | < 0.2 ppb   |  |
| Trace Impurities - Chromium (Cr)  | ≤ 30.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Cobalt (Co)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Copper (Cu)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Gallium (Ga)   | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Germanium (Ge) | ≤ 20 ppb      | < 10 ppb    |  |
| Trace Impurities - Gold (Au)      | ≤ 20 ppb      | < 5 ppb     |  |
| Heavy Metals (as Pb)              | ≤ 100 ppb     | < 50 ppb    |  |
| Trace Impurities – Iron (Fe)      | ≤ 40.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Lead (Pb)      | ≤ 20.0 ppb    | < 10.0 ppb  |  |
| Trace Impurities – Lithium (Li)   | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb      | < 1 ppb     |  |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Nickel (Ni)    | ≤ 20.0 ppb    | < 5.0 ppb   |  |

>>> Continued on page 2 >>>





#### Material No.: 9606-03 Batch No.: 24B1362001

| Test                                | Specification | Result     |  |  |  |
|-------------------------------------|---------------|------------|--|--|--|
| Trace Impurities – Niobium (Nb)     | ≤ 50.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Potassium (K)    | ≤ 50 ppb      | < 10 ppb   |  |  |  |
| Trace Impurities – Silicon (Si)     | ≤ 50 ppb      | < 10 ppb   |  |  |  |
| Trace Impurities – Silver (Ag)      | ≤ 20.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities - Sodium (Na)      | ≤ 150.0 ppb   | < 5.0 ppb  |  |  |  |
| Trace Impurities – Strontium (Sr)   | ≤ 30.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Tantalum (Ta)    | ≤ 10.0 ppb    | < 5.0 ppb  |  |  |  |
| Trace Impurities – Thallium (TI)    | ≤ 10.0 ppb    | < 5.0 ppb  |  |  |  |
| Trace Impurities – Tin (Sn)         | ≤ 20.0 ppb    | < 10.0 ppb |  |  |  |
| Trace Impurities – Titanium (Ti)    | ≤ 10.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities - Vanadium (V)     | ≤ 10.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Zinc (Zn)        | ≤ 20.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Zirconium (Zr)   | ≤ 10.0 ppb    | < 1.0 ppb  |  |  |  |
| Particle Count – 0.5 µm and greater | ≤ 60 par/ml   | 3 par/ml   |  |  |  |
| Particle Count – 1.0 µm and greater | ≤ 10 par/ml   | l par/ml   |  |  |  |
|                                     |               |            |  |  |  |

Nitric Acid 69% CMOS





#### Material No.: 9606-03 Batch No.: 24B1362001

| Test | Specification | Result |  |
|------|---------------|--------|--|
|      |               |        |  |

For Microelectronic Use

Country of Origin: USA Packaging Site: Phillipsburg Mfg Ctr & DC



Sr. Manager, Quality Assurance

Nitric Acid 69% CMOS



# Receive: a/2a/21 net dig



Material No.: 9606-03 Batch No.: 24B1362001 Manufactured Date: 2024-01-25 Retest Date: 2029-01-23 **Revision No.: 0** 

## Certificate of Analysis

| Test                              | Specification | Result      |  |
|-----------------------------------|---------------|-------------|--|
| Assay (HNO3)                      | 69.0 ~ 70.0 % | 69.6 %      |  |
| Appearance                        | Passes Test   | Passes Test |  |
| Color (APHA)                      | ≤ 10          | 5           |  |
| Residue after Ignition            | ≤ 2 ppm       | < 1 ppm     |  |
| Chloride (Cl)                     | ≤ 0.08 ppm    | < 0.03 ppm  |  |
| Phosphate (PO4)                   | ≤ 0.10 ppm    | < 0.03 ppm  |  |
| Sulfate (SO4)                     | ≤ 0.2 ppm     | < 0.2 ppm   |  |
| Trace Impurities – Aluminum (Al)  | ≤ 40.0 ppb    | < 1.0 ppb   |  |
| Arsenic and Antimony (as As)      | ≤ 5.0 ppb     | < 2.0 ppb   |  |
| Trace Impurities – Barium (Ba)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Beryllium (Be) | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Bismuth (Bi)   | ≤ 20.0 ppb    | < 10.0 ppb  |  |
| Trace Impurities - Boron (B)      | ≤ 10.0 ppb    | < 5.0 ppb   |  |
| Trace Impurities - Cadmium (Cd)   | ≤ 50 ppb      | < 1 ppb     |  |
| Trace Impurities - Calcium (Ca)   | ≤ 50.0 ppb    | < 0.2 ppb   |  |
| Trace Impurities - Chromium (Cr)  | ≤ 30.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Cobalt (Co)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Copper (Cu)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Gallium (Ga)   | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Germanium (Ge) | ≤ 20 ppb      | < 10 ppb    |  |
| Trace Impurities - Gold (Au)      | ≤ 20 ppb      | < 5 ppb     |  |
| Heavy Metals (as Pb)              | ≤ 100 ppb     | < 50 ppb    |  |
| Trace Impurities – Iron (Fe)      | ≤ 40.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Lead (Pb)      | ≤ 20.0 ppb    | < 10.0 ppb  |  |
| Trace Impurities – Lithium (Li)   | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb      | < 1 ppb     |  |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Nickel (Ni)    | ≤ 20.0 ppb    | < 5.0 ppb   |  |

>>> Continued on page 2 >>>





#### Material No.: 9606-03 Batch No.: 24B1362001

| Test                                     | Specification | Result     |  |  |  |
|------------------------------------------|---------------|------------|--|--|--|
| Trace Impurities – Niobium (Nb)          | ≤ 50.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Potassium (K)         | ≤ 50 ppb      | < 10 ppb   |  |  |  |
| Trace Impurities – Silicon (Si)          | ≤ 50 ppb      | < 10 ppb   |  |  |  |
| Trace Impurities – Silver (Ag)           | ≤ 20.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities - Sodium (Na)           | ≤ 150.0 ppb   | < 5.0 ppb  |  |  |  |
| Trace Impurities – Strontium (Sr)        | ≤ 30.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Tantalum (Ta)         | ≤ 10.0 ppb    | < 5.0 ppb  |  |  |  |
| Trace Impurities – Thallium (TI)         | ≤ 10.0 ppb    | < 5.0 ppb  |  |  |  |
| Trace Impurities – Tin (Sn)              | ≤ 20.0 ppb    | < 10.0 ppb |  |  |  |
| Trace Impurities – Titanium (Ti)         | ≤ 10.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities - Vanadium (V)          | ≤ 10.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Zinc (Zn)             | ≤ 20.0 ppb    | < 1.0 ppb  |  |  |  |
| Trace Impurities – Zirconium (Zr)        | ≤ 10.0 ppb    | < 1.0 ppb  |  |  |  |
| Particle Count – 0.5 µm and greater      | ≤ 60 par/ml   | 3 par/ml   |  |  |  |
| Particle Count – 1.0 $\mu m$ and greater | ≤ 10 par/ml   | l par/ml   |  |  |  |
|                                          |               |            |  |  |  |

Nitric Acid 69% CMOS





#### Material No.: 9606-03 Batch No.: 24B1362001

| Test | Specification | Result |  |
|------|---------------|--------|--|
|      |               |        |  |

For Microelectronic Use

Country of Origin: USA Packaging Site: Phillipsburg Mfg Ctr & DC



Sr. Manager, Quality Assurance

| _           |                   |                |          | /              |       |                                      | 1. Sodium nitrate (Na) | Compound                                                                             | Description:<br>Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below wa                                                                                                         | CERTIFIED WEIGHT REPORT:<br>Part Numbei<br>Lot Numbei | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|-------------|-------------------|----------------|----------|----------------|-------|--------------------------------------|------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------|
| m/z->       | N<br>0<br>11<br>0 | m/z-≻<br>5.0E6 | N.5<br>6 | m/z-><br>5.0∈6 | 2.5E5 | 5.0E5                                | trate (Na)             | đ                                                                                    | Description:       Sodium (         Expiration Date:       12226         Recommended Storage:       Ambient (2         I Concentration (µg/mL):       10000         NIST Test Number:       6UTB         Weight shown below was dliuted to (mL): | <u>VEIGHT RE</u><br>Part I<br>Lot I                   | standards.c                                                                              |
|             |                   |                |          |                |       | [1] Spec                             | =                      |                                                                                      | Description:<br>Expiration Date:<br>nended Storage:<br>ntration (µg/mL):<br>htration (µg/mL):<br>T Test Number:<br>ST Test Number:                                                                                                               | HT REPORT:<br>Part Number:<br>Lot Number:             | om                                                                                       |
| 0           |                   | 110            |          | 10             |       | [1] Spectrum No.1                    | IN036 NAV01201511      | Lot<br>RM# Number                                                                    | Sodiur<br>12226<br>Ambien<br>10000<br>6UTB<br>6UTB                                                                                                                                                                                               | <u>58111</u><br>122223                                |                                                                                          |
| N<br>N<br>O |                   | 120            |          | N.<br>O        |       | -                                    |                        |                                                                                      |                                                                                                                                                                                                                                                  | 23                                                    | V                                                                                        |
| 230         |                   | 130            |          | а<br>О         |       |                                      | 10000 99.999           | Nominal Purity<br>Conc. (µg/mL) (%)                                                  | 5)<br>3000.4<br>0.06                                                                                                                                                                                                                             |                                                       | RIO                                                                                      |
|             |                   | and here and   |          |                |       | 8.935 sec]:58111.D# [Count] [Linear] | 999 0.10               | ity Uncertainty<br>) Purity (%)                                                      | 2%<br>5E-05 Balance Uncertainty<br>0.06 Flask Uncertainty                                                                                                                                                                                        |                                                       | Certi                                                                                    |
| 240         |                   | 140            |          | 6              |       | .D# [Cot                             | 26.9                   | Assay<br>(%)                                                                         | 2%<br>ncertainty<br>ertainty                                                                                                                                                                                                                     | Solvent:                                              | ified Refu                                                                               |
| N<br>U<br>O |                   | 150            |          | Ö              |       | unt) [Line                           | 111.5406               | Target<br>Weight (g)                                                                 | 60.0<br>(mL)                                                                                                                                                                                                                                     | Lot #<br>24002546                                     | erence Mi<br>MSR 0                                                                       |
| 280         |                   | 160            |          | 0<br>O         |       | ar]                                  | 111.5479               | Actual<br>Weight (g)                                                                 | Nitric Acid                                                                                                                                                                                                                                      | Nitric Acid                                           | Certified Reference Material CRM<br>5 124 MSR06 MS                                       |
|             |                   |                |          | N              |       |                                      | 10000.7                | Actual<br>Conc. (µg/mL)                                                              |                                                                                                                                                                                                                                                  | 3                                                     | RM<br>5807                                                                               |
|             |                   | 170            |          | 70             |       |                                      | 20.0                   | Expanded<br>Uncertainty<br>+/- (µg/mL)                                               | Formulated By:                                                                                                                                                                                                                                   | Allea                                                 |                                                                                          |
|             |                   | 180            |          | 80             |       |                                      | 7631-99-4              | 0                                                                                    | By:                                                                                                                                                                                                                                              | aha                                                   |                                                                                          |
|             |                   | 190            |          | 80             |       |                                      | 5 mg/m3                | SUS information<br>(Solvent Safety Info. On Attached pg.)<br>AS# OSHA PEL (TWA) LD50 | Aleah O'Brady                                                                                                                                                                                                                                    | Brad                                                  | ×                                                                                        |
|             |                   | 200            |          | 100            |       |                                      |                        | SUS Information<br>afety Info. On Atta<br>OSHA PEL (TWA)                             | ady C                                                                                                                                                                                                                                            | All I                                                 | ANAB<br>AR-1<br>https:///                                                                |
|             |                   | ŏ              |          | ŏ              |       |                                      | orl-rat 3430 mg/kg     | ached pg.)<br>سەءە                                                                   | 122223                                                                                                                                                                                                                                           |                                                       | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|             |                   |                |          |                |       |                                      | 9/kg 3152a             | NIST                                                                                 | 223                                                                                                                                                                                                                                              |                                                       | 4 Accred<br>cate Num<br>andards.c                                                        |

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| Printed: 12/29/2023 2:56:20 PM                                                           | Printed: 12/2                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                        |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2 of 2                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                   |                                                                                   |                                                                                                                                 |                                                                                  |                                                                         | 2223                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Lot # 122223                                                                              |                                                                                              | # 58111                                       | Part #     |
|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------|------------|
|                                                                                          | r sed in                                                                                  | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All Standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | nts unless oth<br>ity raw materi<br>e to NIST (see<br>the Uncertaint<br>, D.C. (1994). | ements<br>purity ;<br>eable to<br>ing the<br>gton, D. | The certified value is the concentration calculated from gravimetric and volumetric measureme<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest puri<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All Standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing t<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, | and the<br>and the<br>ith weig<br>ated.<br>atory co<br>atory co<br>flice, | The certified value is the concentration calculated from gravimetric and volume<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with w<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All Standards should be stored with caps tight and under appropriate laboratory<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating a<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Offi | avimetri<br>ass A g<br>are cali<br>are cali<br>ppropria<br>ernmen | from gra<br>rated Cl<br>ior to us<br>ces that<br>lue, unle<br>under a<br>J.S. Gov | ulated<br>er, calib<br>er, calib<br>er, calib<br>er, calib<br>g baland<br>g baland<br>g baland<br>ght and<br>ght and<br>1297, L | tion calc<br>zed wat<br>ally usin<br>ally usin<br>of the st<br>and Ku<br>al Note | ncentra<br>ards.<br>meticule<br>0.5% c<br>0.5% c<br>lor, B.N<br>Technic | The certified value is the concentration calculated from gravi<br>Purified acids, 18.2 megohm deionized water, calibrated Clas<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that ar<br>Standards are certifed (+/-) 0.5% of the stated value, unless<br>All Standards should be stored with caps tight and under app<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin<br>Measurement Result," NIST Technical Note 1297, U.S. Gover | value i<br>s, 18.2<br>ion of<br>e prepa<br>e certifi<br>e certifi<br>Referen<br>it Result | certified<br>preparat<br>preparat<br>dards ar<br>dards ar<br>dards ar<br>tandards<br>suremen | * The<br>* Purif<br>* All s<br>* Stan<br>Mea: |            |
| Certified by:                                                                            | e e                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                        |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | standard.                                                         | on of this                                                                        | reparati                                                                                                                        | ed in the j                                                                      | ts observ                                                               | <b>Physical Characterization:</b><br>Homogeneity: No heterogeneity was observed in the preparation of this standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                   | o heterog                                                                                 | <b>Physical Characterization:</b><br>Homogeneity: No heterogeneity v                         | Physi<br>Homog                                |            |
|                                                                                          | -                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                        |                                                       | alyte                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (T) = Target analyte                                                      | = (T)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                   |                                                                                   |                                                                                                                                 |                                                                                  |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                           |                                                                                              |                                               |            |
| 2 2 × 3 < c *                                                                            | 40.02<br>40.02<br>17<br>40.02<br>17<br>17<br>17<br>17<br>17<br>17<br>17<br>17<br>17<br>17 | Ta Sr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                        |                                                       | 402<br>402<br>402<br>402<br>402<br>402<br>402<br>402<br>402<br>402                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | P P OS NN                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Man Lu<br>Mag                                                     | 4 4 4 4 4 4<br>4 4 4 5 5 5 5 5 5 5 5 5 5 5                                        | 양<br>다 다 타 H H                                                                                                                  | 4 4 4 4 4 4<br>5 8 8 8 8 8 8                                                     | e e e e e e e                                                           | 40.02<br>40.02<br>40.02<br>40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5 S C C S S S                                                                             | 40.02<br>40.02<br>40.02<br>40.02                                                             | Bi<br>Bi                                      |            |
|                                                                                          |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (ua/ml)                                                                                | ומ                                                    | rometry (ICP-MS):<br>Verification by ICP-M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ry (ICP                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ass Spect<br>Metals                                               | asma Ma<br>Trace                                                                  | pled Pla                                                                                                                        | aly Cou                                                                          | ductiv                                                                  | sis by In                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Analys                                                                                    | umenta                                                                                       | Instra                                        |            |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | *                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                        | al CRM                                                | Certified Reference Material C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ference                                                                   | tified Re                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Cen                                                               |                                                                                   |                                                                                                                                 |                                                                                  |                                                                         | s, Inc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ards.con                                                                                  | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                        | Absolute (<br>800-368-1131<br>www.absolute    | 800<br>WWW |

|   | 1.057 | 2.0年7 | m/z-> | р.<br>С.<br>С.<br>С. | 5.0<br>E | 7/2->                   | N<br>0<br>0 | 5.0E5                                 | 1. Antimony (Sb)   | Compound                                                                           | Volume shown below was diluted to (mL): | NIST Test Number:   | Recommended Storage:<br>Nominal Concentration (µg/mL): | Expiration Date:  | Part Number:<br>Lot Number:<br>Description: | CERTIFIED WEIGHT REPORT: | 800-368-1131<br>www.absolutestandards.com                                                |
|---|-------|-------|-------|----------------------|----------|-------------------------|-------------|---------------------------------------|--------------------|------------------------------------------------------------------------------------|-----------------------------------------|---------------------|--------------------------------------------------------|-------------------|---------------------------------------------|--------------------------|------------------------------------------------------------------------------------------|
| ) |       |       | 110   |                      |          | 10                      |             | [1] Spectrum No.1                     | 58151              | Part<br>Number                                                                     | lip sam mo                              | ber                 | nL):                                                   | ate:              | on:                                         |                          |                                                                                          |
|   |       |       | 12.   |                      |          | NO                      |             | 40.1                                  | 1 100923           | Lot<br>r Number                                                                    | uted to (mL)                            | 6UTB                | Ambient (20 °C)<br>1000                                | 120526            | 57051<br>120523<br>Antimony (Sb)            |                          |                                                                                          |
|   |       |       |       |                      |          |                         |             |                                       | 0.1000             | Dilution<br>Factor                                                                 | : 3000.41                               |                     | 20 °C)                                                 |                   | w (Sb)                                      |                          | Ri                                                                                       |
|   |       |       | 130   |                      |          | 30                      |             | 39C]:58                               | 300.0              | Initial<br>Vol. (mL)                                                               |                                         | 5E-05               |                                                        |                   |                                             |                          | Certifi<br>( 0 1) 03 ( 2 4                                                               |
| : |       |       | 140   |                      |          | <b>4</b> 0              |             | 051.D#                                | 0.084              | Uncertainty<br>) Pipette (mL)                                                      |                                         | Balance Uncertainty |                                                        |                   |                                             | ł                        | Certified                                                                                |
|   |       |       | 1 80  |                      |          | 50                      |             | 17.964 sec]:58051.D# [Count] [Línear] | 1000               | Nominal                                                                            | unty                                    | rteintv             |                                                        | 2.0%              | 24002546                                    | Lot #                    | Certified Reference Material CRM<br>(芝り MS802 Mら                                         |
|   |       |       |       |                      |          | Ö                       |             | _(near]                               | 10001.4            | Initial<br>) Conc. (µg/ml                                                          |                                         |                     |                                                        | (mL)              | Nitric Acid                                 | Solvent:                 | nce Material                                                                             |
|   |       |       | 180   |                      |          | 80                      |             |                                       | 1000.0             | Final<br>nL) Conc. (µg/mL)                                                         |                                         |                     |                                                        | Nitric Acid       |                                             |                          | CRM                                                                                      |
|   |       |       | 170   |                      |          | 70                      |             |                                       | 0 2.1              | Expanded<br>Uncertainty<br>mL) +/- (µg/mL)                                         |                                         | Reviewe             | K                                                      | id Formulated By: |                                             |                          | UU<br>UU                                                                                 |
|   |       |       | 180   |                      |          | 80                      |             |                                       | 7440-36-0          | Ĕ                                                                                  | an of                                   |                     | 20                                                     | ited By:          | Ferre                                       |                          |                                                                                          |
|   |       |       | 190   |                      |          | 0                       |             |                                       |                    | Solvent Sa<br>CAS# OSH/                                                            |                                         | Pertr               | the second                                             | Lawr              | and b                                       |                          | V                                                                                        |
|   |       |       |       |                      |          | A. and A. and A. and A. |             |                                       | 0.5 mg/m3          | SDS Information<br>nt Safety Info. On Attac<br>OSHA PEL (TWA)                      |                                         | o I Rentas          | SA )                                                   | Lawrence Barry    | De                                          |                          | Alv<br>AR<br>https                                                                       |
|   |       |       | 200   |                      |          | 100                     |             |                                       | orl-rat 7000 mg/kg | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD50 |                                         |                     |                                                        |                   |                                             |                          | ANAB ISO 1:/034 Accreated<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|   |       |       |       |                      |          |                         |             |                                       | ) mg/kg 3102a      | ) NIST                                                                             | 120020                                  | 120523              |                                                        | 120523            |                                             |                          | tificate l<br>standar                                                                    |

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**Certified Reference Material CRM** 



https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|     |           |    |              |     |                |       | HACE M       | etals  | Verifica | CION | DY ICP-M     | 2 6   | g/mL)          |                |       |     |            |      |                         |
|-----|-----------|----|--------------|-----|----------------|-------|--------------|--------|----------|------|--------------|-------|----------------|----------------|-------|-----|------------|------|-------------------------|
| 2   | 4002      | 24 | 20.02        | 2   | 000            | 117   |              |        |          |      |              | 10000 |                |                |       |     | ALL MARKEN | 1000 | No. of Concession, Name |
| 2   | 2010      | 5  | 20.02        | Ŋ   | 20.02          | H     | 40.02        | 5      | <0.02    | N    | 40.02        | 7     | A)02           | ŝ              | 40.2  | Ţ   | 000        | W    | 88                      |
| Sb  | -         | ç  | 3            | Ţ   | 3              | u,    | 3            | 4      | 2        | 1    |              | 1     | and the second |                | 10.4  | 10  | 20.02      | W    | 20.02                   |
| •   | 1         | ş  | 10.5         | 1   | 20.02          | OUT O | 2002         | L      | 20.02    | NB   | 40.02        | R     | 200            | 5              | 40.02 | 7   | 200        | =    | 3                       |
| AS  | 6         | ç  | 40.02        | E   | 40.02          | 5     |              | Ņ      | 100      | ?    | 3            | į     |                |                |       |     |            |      |                         |
| D,  | 3         | Ş  | 5            | 2   |                |       |              | Gwan C | two      | Ş    | 2000         | N     | 20.02          | Ag             | <0.02 | T   | 40.02      | <    | A.02                    |
| ţ   | 10.02     | ç  | 20.02        | g   | 20.02          | -     | 40.02        | Mn     | 40.02    | Z    | 40.02        | 2     | 40.02          | N <sup>2</sup> | 3     | ţ   | 3          | 5    | 3                       |
| Be  | <u>80</u> | ç  | <b>A</b> .22 | 3   | 3              | ţ1    | 2            | 9      | 2        | ,    |              |       |                | 1              |       | 101 | 20.02      | 11   | 20.05                   |
| ą   | \$        | 2  |              | 1   | and the second |       | 101          | 217    | 6.4      | •    | 20.05        | Ku    | <0.02          | ģ              | <0.02 | þ   | 40.02      | Y    | 202                     |
| 101 | 20.02     | S  | 20,02        | ନ୍ତ | 40.02          | 5     | <b>40.02</b> | Mo     | 4022     | 7    | 2003         | Â     | 33             | 0              | -     | 2   | 2          | 1    |                         |
| B   | 402       | 6  | 8            | An  | 23             | Ż     | 3            |        |          | ;    |              | -     | 10 Mar         | 0              | 20.02 | 20  | 20:02      | 20   | 40.02                   |
| F   | to to the |    | TURN         | 1   | 70.02          | 50    | 20.02        | NQ     | 20.02    | K    | <b>A</b> 012 | 8     | 40.02          | Ţ              | 40.02 | 3   | 20.02      | 2    | 3                       |

(T) = Target analyte

**Physical Characterization:** 

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Certified by:

In P. S.

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

\* Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in

the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use. \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). \* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 57051 Lot # 120523

| N<br>55<br>10<br>0 | m/z-> 110<br>5.0E6 | រា<br>.0<br>៣<br>ភា | m/≥-> 10 | ហ<br>.0<br>ព | [1] Spectrum No.1<br>1.0E7            | 1. Silver nitrate (Ag) | Compound                                                                           | Part Number:       57047         Lot Number:       122823         Description:       Silver (A         Description:       Silver (A         Expiration Date:       122826         Recommended Storage:       Ambient (;         Nominal Concentration (µg/mL):       1000         NIST Test Number:       6UTB         Weight shown below was diluted to (mL): | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com<br>CERTIFIED WEIGHT REPORT: |
|--------------------|--------------------|---------------------|----------|--------------|---------------------------------------|------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|                    | 120                |                     | N.       |              | -                                     | 5 J0612AGA1            | Lot Nor<br>RM# Number Conc. (                                                      | 57047<br>122823<br>Silver (Ag)<br>122826<br>Ambient (20<br>Ambient (20<br>1000<br>6UTB<br>6UTB                                                                                                                                                                                                                                                                 | *                                                                                                 |
|                    | 130<br>140         |                     | 90<br>40 |              | 14.044 sec]:58147.D# [Count] [Linear] | 88.8988 0.10           | Nominal Purity Uncertainty Assay<br>Conc. (Jug/mL) (96) Purity (96) (96)           | *C)<br>5E-05 Balance Uncertainty                                                                                                                                                                                                                                                                                                                               | Certified I<br>R 1 8   5   2 4                                                                    |
|                    | 1<br>ភូ-<br>O      |                     | 50       |              | [Count] [Linear]                      | 6.27992                | Target<br>Weight (g)                                                               | n <b>t:</b> 24002546<br>2% 80.0<br>(mL)                                                                                                                                                                                                                                                                                                                        | Certified Reference Material                                                                      |
|                    | 160 170            |                     | 60 70    |              |                                       | 1000.0                 | Actual Actual U<br>Weight (g) Conc. (µg/mL) +                                      | Nitric Acid                                                                                                                                                                                                                                                                                                                                                    | rial CRM M6030                                                                                    |
|                    | 180                |                     | 80       |              |                                       | <b>2.0</b> 7761-88-8   | Expanded<br>Uncertainty (Solv<br>+/- (µg/mL) CAS#                                  | ad By:                                                                                                                                                                                                                                                                                                                                                         | )30                                                                                               |
|                    | 190 200            |                     | 90 100   |              |                                       | 10 ug/m3               | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD51 | Benson Chan<br>Pedro L. Rentas                                                                                                                                                                                                                                                                                                                                 | http                                                                                              |
|                    | ŏ                  |                     | ŏ        |              |                                       |                        | n<br>ached pg.) NIST<br>LD50 SRM                                                   | 122823                                                                                                                                                                                                                                                                                                                                                         | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com          |

Part # 57047 Lot # 122823

1 of 2

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# Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|    |       |   |             |     |                           |    | I ACE ME   | VIELAIS                                 | Venilcau |         | DY ICP-I                  | NO ( | hg/mL)                                     |           |       |     |               |    |       |
|----|-------|---|-------------|-----|---------------------------|----|------------|-----------------------------------------|----------|---------|---------------------------|------|--------------------------------------------|-----------|-------|-----|---------------|----|-------|
|    |       |   | The station |     | Contraction in the second |    | 12 3 2 201 | 18 - 19 - 19 - 19 - 19 - 19 - 19 - 19 - |          | 2 KU 1  | With a light of the light | 1.12 | 140 10 10 10 10 10 10 10 10 10 10 10 10 10 | No.       |       | No. | State - State |    |       |
| A  | <0.02 | Q | <0.02       | Dy  | <0.02                     | Hf | <0.02      | Γ.                                      | <0.02    | N       | <0.02                     | 7    | <0.02                                      | Se        | <0.2  | ТЪ  | <0.02         | W  | <0.02 |
| SP | <0.02 | Q | <0.2        | 막   | 40.02                     | Но | <0.02      | Lu                                      | <0.02    | Ŋ       | <0.02                     | Re   | <0.02                                      | <u>[2</u> | <0.02 | F   | <0.02         | d  | <0.02 |
| As | 40.2  | ĉ | <0.02       | 臣   | <0.02                     | In | <0.02      | Mg                                      | <0.01    | <u></u> | <0.02                     | Rh   | <0.02                                      | Å         | Т     | H   | <0.02         | <  | <0.02 |
| Ba | <0.02 | S | <0.02       | R   | <0.02                     | Ħ  | <0.02      | Mn                                      | <0.02    | Pd      | <0.02                     | Rb   | <0.02                                      | Na        | <0.2  | ħ   | <0.02         | YЪ | <0.02 |
| Be | <0.01 | Ω | <0.02       | ନ୍ମ | <0.02                     | Fe | <0.2       | Hg                                      | <0.2     | P       | <0.02                     | Ru   | <0.02                                      | ş         | <0.02 | Ta  | <0.02         | ¥  | <0.02 |
| Bi | <0.02 | S | <0.02       | ନ୍ଚ | <0.02                     | 5  | <0.02      | Mo                                      | <0.02    | P       | <0.02                     | Sm   | <0.02                                      | Ś         | <0.02 | Sn  | <0.02         | 7  | <0.02 |
| 8  | <0.02 | 5 | <0.02       | Au  | <0.02                     | Pb | <0.02      | Nd                                      | <0.02    | K       | <0.2                      | %    | <0.02                                      | Ta        | <0.02 | Ð   | <0.02         | 2  | <0.02 |

Homogeneity: No heterogeneity was observed in the preparation of this standard.

(T)= Target analyte

**Physical Characterization:** 

Certified by:

In & She

\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.

\* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above)

\* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

| 800-368-1131<br>www.absolutestandards.com                                                | CERTIFIED WEIGHT REPORT: | Par<br>Loi<br>De                            | Expiration Date:<br>Recommended Storage: | NIST Tex                  | Weight showr                            |                                                           | Compound                 |                                       | N. O | 1.000 | m/z->   | 1.0E4 | 5<br>0<br>0 | m/z->- | 1.0世8 | 5.<br>0<br>8 | ITVZ-> |
|------------------------------------------------------------------------------------------|--------------------------|---------------------------------------------|------------------------------------------|---------------------------|-----------------------------------------|-----------------------------------------------------------|--------------------------|---------------------------------------|------|-------|---------|-------|-------------|--------|-------|--------------|--------|
|                                                                                          | E                        | Part Number:<br>Lot Number:<br>Description: | Expiration Date:<br>nended Storage:      | NIST Test Number:         | Weight shown below was diluted to (mL): |                                                           | VIMH.                    | [1] Spectrum No.1                     |      |       | 10      |       |             | 110    |       |              | 012    |
|                                                                                          |                          | <u>57081</u><br>062724<br>Thalllum (TI)     | 062727<br>Ambient (20 °C)                | 6UTB                      | ed to (mL):                             | Lot                                                       | Number                   | -                                     |      |       | N       |       |             | 120    |       |              | 220    |
|                                                                                          |                          |                                             | °C)                                      | 58                        | 2000.1 0                                | Nominal Pi                                                | Conc. (J/g/mL)           | 14.044 sec                            |      |       | a<br>O  |       |             | 130    |       |              | 230    |
| Certified Refi<br>R ! 8]5]24                                                             |                          | Š                                           |                                          | 5E-05 Balance Uncertainty | 0.10 Flask Uncertainty                  | Purity Uncertainty Assay                                  | (%) PUTTY (%)            | 14.044 sec]:57081.D# [Count] [Linear] |      |       | 4.<br>0 |       |             | 140    |       |              | 240    |
| Certified Reference Material CRM<br>とという                                                 |                          | Solvent: 2400                               | 2% 40<br>(m                              | pertainty                 | ainty                                   | y Assay Target                                            | (%) Weight (g)           | ₩ [Count] [Li                         |      |       | 01      |       |             | 150    |       |              | 250    |
| e Material                                                                               |                          | 24002546 Nitric Acid                        | 40.0 Nitric Acid<br>(mL)                 |                           |                                         | get Actual                                                |                          | [Linear]                              |      |       |         |       |             |        |       |              |        |
| <b>СRМ</b><br>М6023                                                                      |                          | loid                                        | cid                                      |                           |                                         | Actual                                                    | Weight (g) Conc. (µg/mL) |                                       |      |       | 8       |       |             | 160    |       |              | 260    |
| 23                                                                                       |                          | Alea                                        | Formulated By:                           | Reviewed By:              |                                         | Expanded<br>Uncertainty                                   | L) +/- (µg/mL)           |                                       |      |       | 70      |       |             | 170    |       |              |        |
|                                                                                          |                          | 20                                          | 8                                        |                           |                                         | (Solvent                                                  | CAS#                     |                                       |      |       | 80      |       |             | 180    |       |              |        |
| http                                                                                     |                          | Grandly                                     | Aleah O'Brady                            | Pedro L. Rentas           |                                         | SDS Information<br>Safety Info. On Atta                   | OSHA PEL (TWA)           |                                       |      |       | 8       |       |             | 190    |       |              |        |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |                          |                                             | 062724                                   | 062724                    |                                         | SDS Information<br>(Solvent Safety Info. On Attached pg.) | DSG1                     |                                       |      |       | 100     |       |             | 200    |       |              |        |
| Accredite<br>te Numbe<br>dards.con                                                       | ٤                        |                                             | 4                                        | 4                         | l                                       | NIST                                                      | SKM                      |                                       |      |       |         |       |             |        |       |              |        |

Part # 57081 Lot # 062724

1 of 2

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https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

# Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|                                          | E     | χđ        | 10    | i ș   | Re             | Ba          | 2     | >     | Sb     | A     |                                                                                                                 | T        |          |
|------------------------------------------|-------|-----------|-------|-------|----------------|-------------|-------|-------|--------|-------|-----------------------------------------------------------------------------------------------------------------|----------|----------|
|                                          |       | <002      | 20.02 | 0.01  | 100-           | A0.02       | 20.2  | 2     | 2002   | 20.02 |                                                                                                                 |          |          |
|                                          |       | 2         | S     | 2     | ç              | ĉ           | Ę     | ? (   | ç      | ß     |                                                                                                                 |          |          |
|                                          | 10.01 | 50        | <0.02 | 70.02 | 200            | <0.02       | 20.05 |       | 502    | <0.02 |                                                                                                                 |          |          |
|                                          | 20    | <u>۸.</u> | ନ୍ଚ   | Ga    | ?              | ଜୁ          | E     | 1 [   | ų      | Dy    |                                                                                                                 |          |          |
|                                          | 70.07 | 23        | <0.02 | 20.02 | 3              | <0.02       | 20.02 | 20.02 | 500    | <0.02 | The second se |          |          |
|                                          | 10    | P         | Ľ     | не    | 1              | 7           | In    | DIT.  | 5      | Hf    |                                                                                                                 |          |          |
|                                          | 20.02 | 3         | A0.02 | <0.2  | 10101          | <b>2003</b> | <0.02 | 20.05 | 3      | <0.02 |                                                                                                                 | Tace M   | -        |
|                                          | NO    |           | Mo    | ВH    |                | Š           | Mg    | L.    | 1      | 5     | Superior of                                                                                                     |          | ADtolo   |
| 9                                        | 20.02 |           | A0.03 | <0.2  | 10.02          | 505         | <0.01 | <0.02 | 3      | <0.02 | WINDER HURST                                                                                                    | VEINICA  | Varifina |
|                                          | Ĕ     | 1;        | Ş     | ď     | 2              | 2           | õ     | No    | í      | N.    |                                                                                                                 |          |          |
|                                          | 40.2  | 10.01     | 30    | <0.02 | 20.02          | 2           | <0.02 | 20.02 |        | 40.02 | 100 m 100 m                                                                                                     | by icr-  |          |
|                                          | Sc    | 011       | 2     | Ru    | N              | ļ           | R     | Re    | 1      | Ŗ     |                                                                                                                 | N CIM    | No 1     |
|                                          | <0.02 | 20.02     | 3     | <0.02 | 20.05          | 2           | <0.02 | <0.02 | a cion | 50.02 |                                                                                                                 | nd/ uur) |          |
|                                          | Ta    | G         | 0     | Sr    | Na             | 5           | Ag    | S     | Ş      | 2     | And a state of the                                                                                              |          |          |
|                                          | <0.02 | 20.02     | 2     | <0.02 | 202            |             | <0.02 | A0.02 | 101    | 5     |                                                                                                                 |          |          |
|                                          | Ξ     | NO.       | 2     | ī     | Ш.             |             | -     | Te    |        |       |                                                                                                                 |          |          |
|                                          | 40.02 | 20.02     | 2     | 40.02 | <0.02          | Þ           | -1    | <0.02 | 70.02  | 500   | COLUMN TWO AND ADDRESS OF THE OWNER.                                                                            |          |          |
| 10 10 10 10 10 10 10 10 10 10 10 10 10 1 | Zr    | 20        | 9     | ×     | Υ <sub>β</sub> | -           | <     | c     |        |       |                                                                                                                 |          |          |
|                                          | <0.02 | 40.02     |       | 40.02 | 40,02          | 20.02       | 3     | 40.02 | <0.02  | 5     |                                                                                                                 |          |          |

(I) = Target analyte

# Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

Ser P. S.

Certified by:

\* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.

\* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

\* All Standards should be stored with caps tight and under appropriate laboratory conditions.
 \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST
 \* Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

\*^

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |          | Part Number: 57023<br>Lot Number: 062424<br>Description: Vanadium (V) | Expiration Date: 062427 |                     | vas dilut         | Part Lot Dilution                                         | Compound Number Number Factor | [1] Spectrum No.1 [ 34.243<br>2.0E6   |  | m/z->- 10 20  | 2.067 | 1.027 | m/z->- 110 120 1 | 2.5E8 |     |
|------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------|-------------------------|---------------------|-------------------|-----------------------------------------------------------|-------------------------------|---------------------------------------|--|---------------|-------|-------|------------------|-------|-----|
| B . S<br>Ce                                                                              |          |                                                                       |                         | 5E-05               |                   | n Initial                                                 | Vol. (mL)                     | 3 580]:58(                            |  | 00            |       |       | 130              |       |     |
| Certified Reference Material CRM<br>冬瓜 プレリ                                               |          |                                                                       |                         | Balance Uncertainty | Flask Uncertainty | Uncertainty                                               | Pipette (mL) Conc. (µg/mL)    | 34.243 sec]:58023.D# [Count] [Linear] |  | <b>A</b><br>0 |       |       | 140              |       | 240 |
| ference M                                                                                | Lot #    | 24002546                                                              | 2,0%                    | Ż                   |                   | Nominal                                                   |                               | ount) [Lin                            |  | 50            |       |       | 150              |       | 250 |
| laterial CR                                                                              | Solvent: | Nitric Acid                                                           | 40.0<br>(mL)            |                     |                   | Initial                                                   | Conc. (µg/mL)                 | ear]                                  |  | 80            |       |       | 160              |       | 260 |
| <b>M</b><br>M6021                                                                        | -        |                                                                       | Nitric Acid             |                     |                   | Final                                                     | Conc. (µg/mL)                 |                                       |  | 70            |       |       | 170              |       |     |
|                                                                                          |          | Allea                                                                 | Formulated By:          | Reviewed Rv:        |                   | Expanded                                                  | +/- (µg/mL)                   |                                       |  | 1<br>7<br>1   |       |       |                  |       |     |
|                                                                                          |          | Alleah & Brack                                                        |                         | to Je               |                   | (Solvent                                                  | CAS#                          |                                       |  | 80            |       |       | 180              |       |     |
| http://www.a                                                                             |          | Apa                                                                   | Aleah O'Brady           | Pedro I. Rentas     |                   | SDS Information<br>Safety Info. On Atta                   | OSHA PEL (TWA)                |                                       |  | 80            |       |       | 190              |       |     |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |          |                                                                       | 062424                  | 062424              |                   | SDS Information<br>(Solvent Safety Info. On Attached pg.) | A) LD50                       |                                       |  | 100           |       |       | 200              |       |     |
| Accreditec<br>e Number<br>fards.com                                                      | ų        |                                                                       | <u> </u>                | -                   | Ľ                 | NIST                                                      | SRM                           |                                       |  |               |       |       |                  |       |     |

1 of 2

Printed: 8/1/2024, 2:13:49 PM

Lot # 062424

Part # 57023





https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

# Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

|                |        | æ     | זפ    | p l          | Ŗ     | 152   | į     | Ac    | 20       | 2            | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      | I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
|----------------|--------|-------|-------|--------------|-------|-------|-------|-------|----------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                | 1000   | 40.02 | 20.05 | 5            | 5005  | 20.02 |       | 3     | <0.02    |              | 0.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                |        | 2     | S     | ) (          | ç     | ຊ     | 1     | 2     | 5        |              | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | ANN!   | 2033  | <0.02 | 20.01        | 3     | <0.02 | 70.02 | 3     | 40.2     |              | 40.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | A REAL PROPERTY OF   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | 200    | An    | ç     |              | 3     | ନ୍ଥ   | Ę     | 1     | 막        | -            | Dv I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | 70.02  | 3     | 40.02 | 20.02        | 2     | <0.02 | 20.05 | 3     | <0.02    |              | co no                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | THE REAL PROPERTY OF | Statement and statement of the statement |          |
|                | 10     | ģ     | 5     | re           | 7     | 5     | h     | 4     | Но       | ***          | Hf                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Cardena and          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | \$0.02 | 3     | A0.02 | 705          | 5     | A.02  | 20.02 |       | A.2      | 20.02        | 2002                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | - State State        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Trace M  |
|                | Na     |       | Mo    | Hg           | :     | Mb    | Mg    |       | Ę        | 11           | T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.00 mm 100 mm 100   | 0000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Ptals    |
| (T) = Targ     | 20.02  |       | 40.02 | <b>4</b> 0.2 | 5     | 40.02 | 10.0> |       | 40.02    | 70.02        | 200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SCHOOL STOR          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Verifica |
| Target analyte | ľ.     | 1     | ¥     | P            |       | P     | õ     | ł     | Ş        | IN           | NE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1 H2 1 1 1 1         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | tion     |
| e              | 40,2   |       | 40.02 | <0.02        |       | 402   | <0.02 |       | 40.02    | 20.05        | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | Sc     | Ê     | 2     | Ru           |       | 퍗     | Rŀ    |       | ZJ<br>P  | 3            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | A0.02  | 10.04 | 3     | <0.02        | 10.04 | 300   | <0.02 | 10.04 | 33       | <0.02        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1/ml     |
|                | Ta     | ζ     | ^     | ş            | 111   | Ş,    | Ag    | 2     | <u>"</u> | se           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | <0.02  | 70.02 | 3     | 40.02        | 10.1  | 500   | A0.02 | 20.02 | 3        | <0.2         | Contraction of the local division of the loc |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | П      | JHC . | î     | ľ            | 10    | ļ     | đ     | IC    | 7        | Ъ            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | <0.02  | 20.02 | 2     | <0.02        | 20.02 | 3     | <0.02 | 20.02 | 3        | <b>A</b> .02 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | Zr     | 112   | ą     | Y            | 10    | ş .   | V     | c     | :        | *            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
|                | <0.02  | 20.02 |       | 40,02        | 20.02 | 3     | -)    | 20.02 |          | <0.02        | Contraction of the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |

## Physical Characterization:

Homogeneity: No heterogeneity was observed in the preparation of this standard.

In P. Sur

Certified by:

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

- \* All standard containers are meticulously cleaned prior to use. \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

\* All Standards should be stored with caps tight and under appropriate laboratory conditions. \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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