

284 Sheffield Street, Mountainside, New Jersey 07092, Phone: 908 789

8900, Fax: 908 789 8922

### **Prep Standard - Chemical Standard Summary**

| Order ID | : | P5043 |
|----------|---|-------|
|----------|---|-------|

Test: Metals CLP Full

Prepbatch ID: PB165364,

Sequence ID/Qc Batch ID: LB133883,

| Sta | nd | ar | d I | n |  |
|-----|----|----|-----|---|--|
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MP83122, MP83134, MP83141, MP83147, MP83500, MP83501, MP83502, MP83503, MP83504, MP83505, MP83506, MP83507, MP83508, MP83509, MP83510, MP83511, MP83513, MP83514, MP83508, MP83509, MP83509, MP83510, MP83511, MP83513, MP83514, M

### Chemical ID:

M5130, M5218, M5223, M5289, M5295, M5296, M5390, M5393, M5429, M5473, M5476, M5496, M5497, M5498, M5513, M5515, M5519, M5658, M5697, M5698, M5751, M5768, M5769, M5799, M5800, M5801, M5802, M5806, M5815, M5816, M5817, M5818, M5819, M5820, M5875, M5959, M5960, M5962, M5970, M5976, M5978, M5982, M5985, M5990, M5999, M6021, M6023, M6025, M6028, M6030, M6033, M6111, M6116, M6117, M6121, M6125, M6126, W3112,





Metals STANDARD PREPARATION LOG

| Recipe<br>ID | NAME    | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipettelD</u> | Supervised By Sarabjit Jaswal |
|--------------|---------|------------|------------|--------------------|----------------|----------------|------------------|-------------------------------|
| 169          | 1:1HNO3 | MP83122    | 11/07/2024 | 12/06/2024         | Janvi Patel    | None           | None             |                               |
|              |         |            |            |                    |                |                |                  | 11/07/2024                    |

FROM 1000.00000ml of M6116 + 1000.00000ml of W3112 = Final Quantity: 2000.000 ml

| Recipe<br>ID | NAME                          | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By  Mohan Bera |
|--------------|-------------------------------|------------|------------|--------------------|---------------------|----------------|------------------|---------------------------|
| 902          | ICP AES CAL BLK ( SO/ICB/CCB) | MP83134    | 10/30/2024 | 12/06/2024         | Kareem<br>Khairalla | None           | None             | 11/08/2024                |

FROM 125.00000ml of M6111 + 2350.00000ml of W3112 + 25.00000ml of M6117 = Final Quantity: 2500.000 ml



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| Recipe<br>ID | <u>NAME</u>               | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By  Mohan Bera |
|--------------|---------------------------|---------|------------|--------------------|---------------------|----------------|------------------|---------------------------|
| 994          | ICPAES ISM01.2 S1 (CONC.) | MP83141 | 10/30/2024 | 12/06/2024         | Kareem<br>Khairalla | None           | None             | 11/08/2024                |

**FROM** 

0.02000 ml of M5815 + 0.03000 ml of M5429 + 0.10000 ml of M5798 + 0.10000 ml of M6028 + 0.14000 ml of M5799 + 0.20000 ml of M5476 + 0.20000 ml of M5515 + 0.20000 ml of M5658 + 0.20000 ml of M5801 + 0.20000 ml of M5817 + 0.20000 ml of M5976 + 0.20000 ml of M6025 + 0.20000 ml of M6030 + 0.30000 ml of M5698 + 0.40000 ml of M6033 + 0.50000 ml of M5751 + 0.50000 ml of M6023 + 0.70000 ml of M5962 + 0.80000 ml of M5960 + 1.00000 ml of M5800 + 1.00000 ml of M5819 + 10.00000 ml of M5498 + 10.00000 ml of M5519 + 10.00000 ml of M5768 + 10.00000 ml of M5806 + 10.00000 ml of M5818 + 2.00000 ml of M5978 + 4.00000 ml of M5390 + 34.24000 ml of MP83134 = Final Quantity: 100.000 ml

| Recipe<br>ID | <u>NAME</u>        | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By  Mohan Bera |
|--------------|--------------------|---------|------------|--------------------|---------------------|----------------|------------------|---------------------------|
| 921          | ICPAES SPIKE SOL#6 | MP83147 | 10/30/2024 | 12/06/2024         | Kareem<br>Khairalla | None           | None             | 11/08/2024                |

**FROM** 2.50000ml of M5962 + 50.00000ml of M5990 + 50.00000ml of M5999 + 147.50000ml of MP83134 = Final Quantity: 250.000 ml





Metals STANDARD PREPARATION LOG

| Recipe<br>ID | NAME                          | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabiit Jaswal |
|--------------|-------------------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 902          | ICP AES CAL BLK ( SO/ICB/CCB) | MP83500    | 12/06/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

| FROM | 125.00000ml of M6121 | + 2350.00000ml of W3112 + | 25.00000ml of M6126 | = Final Quantity: 2 | 500.000 ml |
|------|----------------------|---------------------------|---------------------|---------------------|------------|
|------|----------------------|---------------------------|---------------------|---------------------|------------|

| Recipe<br>ID | NAME                  | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-----------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 2480         | ICP AES STD 6 ISM01.3 | MP83501    | 12/06/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

**FROM** 4.00000ml of M5289 + 4.00000ml of M5498 + 4.00000ml of M5515 + 4.00000ml of M5768 + 4.00000ml of M5806 + 30.00000ml of MP83500 = Final Quantity: 50.000 ml



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|--------------|---------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 1004         | ICPAES ISM01.2 (S5) | MP83502    | 12/06/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

**FROM** 

0.25000 ml of M5798 + 0.50000 ml of M5429 + 0.50000 ml of M5473 + 0.50000 ml of M5815 + 0.50000 ml of M5817 + 12.50000 ml of M5819 + 12.50000 ml of M5698 + 12.50000 ml of M5806 + 12.50000 ml of M5819 + 13.75000 ml of M5697 + 14.50000 ml of M5698 + 14.50000 ml of M5515 + 14.50000 ml of M5658 + 2.00000 ml of M5513 + 22.50000 ml of M5497 + 22.50000 ml of M5497 + 22.50000 ml of M5875 + 5.00000 ml of M5893 + 5.00000 ml of M5802 + 5.00000 ml of M5818 + 5.00000 ml of M5875 + 303.50000 ml of M783500 = Final Quantity: 500.000 ml

| Recipe<br>ID | NAME               | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|--------------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 1005         | ICPAES ISM01.2(S4) | MP83503 | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

**FROM** 250.00000ml of MP83500 + 250.00000ml of MP83502 = Final Quantity: 500.000 ml





### Metals STANDARD PREPARATION LOG

| 1007 ICPAES ISM01.2(S3) MP83504 12/09/2024 01/06/2025 Kareem Khairalla None None 12/09/2024 | <u>F</u> | Recipe<br>ID | <u>NAME</u>        | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|---|----------|--------------|--------------------|---------|------------|--------------------|----------------|----------------|------------------|-------------------------------|
|   |          | 1007         | ICPAES ISM01.2(S3) | MP83504 | 12/09/2024 | 01/06/2025         |                | None           | None             | 12/09/2024                    |

**FROM** 25.00000ml of MP83502 + 75.00000ml of MP83500 = Final Quantity: 100.000 ml

| Recipe            | NAME                    | NO             | Duan Data               | Expiration                | <u>Prepared</u>     | CastalD                | DimettelD         | Supervised By   |
|-------------------|-------------------------|----------------|-------------------------|---------------------------|---------------------|------------------------|-------------------|-----------------|
| <u>ID</u><br>1008 | NAME ICPAES ISM01.2(S2) | NO.<br>MP83505 | Prep Date<br>12/09/2024 | <u>Date</u><br>01/06/2025 | <u>By</u><br>Kareem | <u>ScaleID</u><br>None | PipetteID<br>None | Sarabjit Jaswal |
|                   | , ,                     |                |                         |                           | Khairalla           |                        |                   | 12/09/2024      |

**FROM** 12.50000ml of MP83502 + 87.50000ml of MP83500 = Final Quantity: 100.000 ml



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### Metals STANDARD PREPARATION LOG

| Recipe           |                                |                |                         | Expiration                | Prepared            |                        |                   | Supervised By   |
|------------------|--------------------------------|----------------|-------------------------|---------------------------|---------------------|------------------------|-------------------|-----------------|
| <u>ID</u><br>994 | NAME ICPAES ISM01.2 S1 (CONC.) | NO.<br>MP83506 | Prep Date<br>12/09/2024 | <u>Date</u><br>01/06/2025 | <u>By</u><br>Kareem | <u>ScaleID</u><br>None | PipetteID<br>None | Sarabjit Jaswal |
|                  | (22.27)                        |                |                         |                           | Khairalla           |                        |                   | 12/09/2024      |

**FROM** 

0.02000 ml of M5815 + 0.03000 ml of M5429 + 0.10000 ml of M5798 + 0.10000 ml of M6028 + 0.14000 ml of M5799 + 0.20000 ml of M5473 + 0.20000 ml of M5515 + 0.20000 ml of M5658 + 0.20000 ml of M5801 + 0.20000 ml of M5817 + 0.20000 ml of M5817 + 0.20000 ml of M5817 + 0.20000 ml of M5698 + 0.40000 ml of M5496 + 0.50000 ml of M5697 + 0.50000 ml of M6023 + 0.70000 ml of M5962 + 0.80000 ml of M5960 + 1.00000 ml of M5800 + 1.00000 ml of M5691 + 10.00000 ml of M5806 + 1.20000 ml of M5819 + 10.00000 ml of M5498 + 10.00000 ml of M5519 + 10.00000 ml of M5818 + 2.00000 ml of M5978 + 4.00000 ml of M5390 + 34.24000 ml of MP83500 = Final Quantity: 100.000 ml

| Recipe<br>ID | <u>NAME</u>       | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 1003         | ICPAES ISM01.2 S1 | MP83507    | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

**FROM** 0.50000ml of MP83506 + 99.50000ml of MP83500 = Final Quantity: 100.000 ml



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|--------------|------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 2054         | ICV-ICPAES | MP83508 | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

FROM 0.50000ml of M5218 + 0.50000ml of M5816 + 0.50000ml of M5820 + 0.50000ml of M5970 + 0.50000ml of M5982 + 10.00000ml of M5295 + 87.50000ml of MP83500 = Final Quantity: 100.000 ml

| Recipe<br>ID | NAME              | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By Sarabjit Jaswal |
|--------------|-------------------|------------|------------|--------------------|---------------------|----------------|--------------------------|-------------------------------|
| 904          | ICP AES ICSA SOLN | MP83509    | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | METALS_PIP<br>ETTE_3 (A) | ,                             |

**FROM** 10.00000ml of M5130 + 90.00000ml of MP83500 = Final Quantity: 250.000 ml



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|--------------|--------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 905          | ICP AES ICSAB SOLN | MP83510    | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

FROM 10.00000ml of M5130 + 10.00000ml of M5223 + 80.00000ml of MP83500 = Final Quantity: 250.000 ml

| Recipe<br>ID | NAME                | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|---------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 1119         | ICPAES ISM01.2(CCV) | MP83511    | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

FROM 0.75000ml of M5497 + 0.75000ml of M5769 + 1.22500ml of M5496 + 1.25000ml of M5515 + 1.25000ml of M5806 + 19.77500ml of MP83500 + 25.00000ml of MP83502 = Final Quantity: 50.000 ml



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| Recipe<br>ID | NAME                 | <u>NO.</u> | Prep Date  | Expiration<br>Date | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabiit Jaswal |
|--------------|----------------------|------------|------------|--------------------|------------------------------|----------------|------------------|-----------------|
| 919          | ICP AES INTERNAL STD | MP83513    | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla          | None           | None             | 12/09/2024      |

FROM 1.00000ml of M5959 + 10.00000ml of M5985 + 1969.00000ml of W3112 + 20.00000ml of M6126 = Final Quantity: 2000.000 ml

| Recipe<br>ID | NAME       | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 513          | RINSE SOLN | MP83514    | 12/09/2024 | 01/06/2025         | Kareem<br>Khairalla | None           | None             | 12/09/2024                    |

**FROM** 200.0000ml of M6126 + 9800.0000ml of W3112 = Final Quantity: 10000.000 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    | 12/28/2024         | 05/20/2024 /<br>jaswal     | 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 # |
| 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    | 12/28/2024         | 05/20/2024 /<br>jaswal     | 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. | 58113 / Aluminum (AI)<br>10,000PPM   | 070622       | 07/06/2025         | 09/02/2022 /<br>jaswal     | 07/12/2022 /<br>jaswal         | M5289             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| EPA                         | ICV-1 / ICV (ICP/ICPMS)<br>STOCK SOLN  | ICV-1014     | 02/05/2025         | 08/07/2024 /<br>jaswal     | 04/20/2021 /<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         | 10/12/2022 /<br>bin        | 09/19/2022 /<br>bin            | M5393             |
| 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. | 57138 / Sr, 10000 PPM,<br>125 ml           | 082922       | 08/29/2025         | 03/16/2023 /<br>jaswal     | 03/16/2023 /<br>jaswal         | M5473             |
| Supplier                    | ItemCode / ItemName                        | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57138 / Sr, 10000 PPM,<br>125 ml           | 082922       | 08/09/2025         | 07/29/2024 /<br>jaswal     | 03/16/2023 /<br>jaswal         | M5476             |
|                             | ItemCode / ItemName                        | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Supplier                    | nemodae / nemodane                         |              | Date               |                            |                                |                   |



| 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         | 03/18/2023 /<br>bin        | 03/17/2023 /<br>bin            | M5497             |
| 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 Date    | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57182 / Pb, 10000 PPM,<br>125 ml          | 061522 | 06/15/2025         | 03/19/2023 /<br>bin        | 03/17/2023 /<br>bin            | M5513             |
| Supplier                    | ItemCode / ItemName                       | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /                | 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 # |
| Absolute<br>Standards, Inc. | 57119 / Potassium (K)<br>10,000PPM        | 120822 | 12/08/2025         | 01/08/2024 /<br>bin        | 03/17/2023 /<br>bin            | M5519             |
| 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             |  |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration 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. | ,                                |        | 07/17/2026         | 10/01/2024 /<br>Jaswal     | 08/25/2023 /<br>jaswal         | M5751             |  |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |  |
| Absolute<br>Standards, Inc. | 58112 / Mg, 10000 PPM,<br>500 ml | 091823 | 09/18/2026         | 01/08/2024 /<br>bin        | 01/03/2024 /<br>bin            | M5768             |  |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /                | 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 Date    | Date Opened /<br>Opened By | Received Date /                | 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. | ,                                |        | 07/11/2026         | 02/09/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5799             |
| 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 /                | 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 |        |                    | 08/01/2024 /<br>Jaswal     | 01/03/2024 /<br>jaswal         | M5806             |
|                             |                                  |        |                    |                            |                                |                   |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration 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. | , |        | 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. |   |        | 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             |
|                             | ItemCode / ItemName                     | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Supplier                    |   |        |                    |                            |                                |                   |



| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|--|-------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic<br>Ventures       | -  |             | 02/20/2029         | 07/01/2024 /<br>Jaswal     | 06/14/2024 /<br>Jaswal         | M5959             |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57028 / Ni, 1000 PPM, 125<br>ml            | 041124      | 04/11/2027         | 07/03/2024 /<br>kareem     | 06/11/2024 /<br>kareem         | M5960             |
| Supplier                    | Supplier ItemCode / ItemName               |             | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. |  |             | 06/06/2027         | 07/02/2024 /<br>Jaswal     | 06/14/2024 /<br>Jaswal         | M5962             |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57003 / Li, 1000 PPM, 125<br>ml            | 061224      | 06/21/2027         | 07/01/2024 /<br>Jaswal     | 07/01/2024 /<br>Jaswal         | M5970             |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CGMO1-1 /<br>MOLYBDENUM 125mL<br>1000ug/mL | T2-MO720876 | 07/17/2027         | 08/07/2024 /<br>jaswal     | 02/22/2024 /<br>Jaswal M5976   |                   |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|                             |  |             | 06/17/2027         | 08/07/2024 /               | 02/22/2024 /                   |                   |



| Supplier                    | ItemCode / ItemName   | Lot #        | Expiration<br>Date          | Date Opened /<br>Opened By | Received Date /<br>Received By            | Chemtech<br>Lot #     |
|-----------------------------|---|--------------|-----------------------------|----------------------------|---|-----------------------|
| Absolute<br>Standards, Inc. | ,                                       |              | 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       | 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       | CLPP-SPK-5 / CLP Spike<br>Standard 5  | V2-MEB742037 | 03/12/2029                  | 10/04/2024 /<br>Jaswal     | 02/22/2024 /<br>Jaswal                    | M5990                 |
| Supplier                    | ItemCode / ItemName   | Lot #        | Expiration<br>Date          | Date Opened /<br>Opened By | Received Date /<br>Received By            | Chemtech<br>Lot #     |
|                             |   |              |                             |                            |   |                       |
| Inorganic<br>Ventures       | CLPP-SPK-1 /<br>SOIL/WATER SPIKE SOLN<br>1, 125mL                             | T2-MEB721963 | 07/27/2027                  | 09/04/2024 /<br>Jaswal     | 02/22/2024 /<br>kareem                    | M5999                 |
| _                           | SOIL/WATER SPIKE SOLN   | T2-MEB721963 | 07/27/2027  Expiration Date |                            |   | M5999  Chemtech Lot # |
| Ventures                    | SOIL/WATER SPIKE SOLN<br>1, 125mL   |              | Expiration                  | Jaswal  Date Opened /      | kareem  Received Date /                   | Chemtech              |
| Supplier Absolute           | SOIL/WATER SPIKE SOLN 1, 125mL  ItemCode / ItemName  57023 / V, 1000 PPM, 125 | Lot #        | Expiration<br>Date          | Date Opened / Opened By    | Received Date / Received By  08/05/2024 / | 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. | ,  |                     | 11/09/2026         | 08/05/2024 /<br>Jaswal     | 08/05/2024 /<br>Jaswal          | M6025             |
| 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     | 08/05/2024 /<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. | 9, ,   |                     | 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 / AI, 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 # |
| Supplier Seidler Chemical   | ItemCode / ItemName  BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L) | Lot #<br>22F0762009 | I -                | -                          |                                 |                   |
|                             | BA-9530-33 / Hydrochloric<br>Acid, Instra-Analyzed                               |                     | Date               | Opened By<br>11/04/2024 /  | <b>Received By</b> 09/29/2024 / | Lot #             |



| 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          | 05/06/2025         | 11/06/2024 /<br>Janvi      | 09/29/2024 /<br>Eman           | M6117             |
| Supplier                       | ItemCode / ItemName  | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical               | Chemical BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L) |                     | 05/13/2025         | 11/13/2024 /<br>Eman       | 10/13/2024 /<br>Eman           | M6121             |
| 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              | 05/25/2025         | 11/26/2024 /<br>Eman       | 11/22/2024 /<br>Eman           | M6125             |
| 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          | 06/03/2025         | 12/03/2024 /<br>Janvi      | 11/12/2024 /<br>Janvi          | M6126             |
| 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 | 07/03/2029         | 07/03/2024 /<br>Iwona      | 07/03/2024 /<br>Iwona          | W3112             |



Certificate of Analysis

R: 02/22/24 M5986 M5987 M5988 M5989 M5999

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:

CLPP-SPK-5

Lot Number:

V2-MEB742037

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

100 µg/mL ea:

Antimony,

50 μg/mL ea:

Selenium,

Thallium,

Cadmium,

40 μg/mL ea: Arsenic,

Alderiie,

20 µg/mL ea: Lead

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Antimony, Sb **CERTIFIED VALUE** 

ANALYTE Arsenic, As **CERTIFIED VALUE** 

40.00 ± 0.26 μg/mL

Cadmium, Cd

100.0 ± 0.7 μg/mL 49.99 ± 0.22 μg/mL

Lead. Pb

19.99 ± 0.09 µg/mL

Selenium, Se

50.00 ± 0.23 μg/mL

Thallium, Ti

50.00 ± 0.22 μg/mL

Density:

1.025 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

| ANALYTE | METHOD     | NIST SRM# | SRM LOT#     |
|---------|------------|-----------|--------------|
| As      | ICP Assay  | 3103a     | 100818       |
| Cd      | ICP Assay  | 3108      | 130116       |
| Cd      | EDTA       | 928       | 928          |
| Cd      | Calculated |           | See Sec. 4.2 |
| Pb      | ICP Assay  | 3128      | 101026       |
| Pb      | EDTA       | 928       | 928          |
| Pb      | Calculated |           | See Sec. 4.2 |
| Sb      | ICP Assay  | 3102a     | 140911       |
| Se      | ICP Assay  | 3149      | 100901       |
| Se      | Calculated |           | See Sec. 4.2 |
| TI      | ICP Assay  | 3158      | 151215       |
| ТΙ      | 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>CRM/RM</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<sub>i</sub> = the weighting factors for each method calculated using the inverse square of the variance;

 $\mathbf{w_i} = (1/\mathbf{u_{char\,i}})^2 \, / \, (\Sigma (1/(\mathbf{u_{char\,i}})^2)$ 

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k \left(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts}\right)^{1/a}$ 

k = coverage factor = 2

 $u_{char} \simeq [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$  where  $u_{char}$  are the errors from each characterization method

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 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:

 $X_{CRM/RM} = (X_a) \{u_{char} a\}$ 

Xa = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k (u^2_{chara} + u^2_{bb} + u^2_{its} + u^2_{ts})^{1/2}$ 

k = coverage factor = 2

uchar a = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

u<sub>lits</sub> = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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>

<a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. 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° 24° C to minimize the effects of transpiration. Use at 20° ± 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

### 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

March 12, 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

- March 12, 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.

Paul R Saine

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

**Expiration Date:** 

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

**SDS Information** 

(Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50

**NIST** SRM

m/z-> -z/m m/z-> 1.0E7 2.0E7 5.OE4 1.0E5 2.5E4 5.0M4 [1] Spectrum No.1 010 110 0 220 120 20 [ 12.514 sec]:58148.D# [Count] [Linear] 230 130 30 240 140 40 N00 150 50 2000 160 60 170 70 180 80 061 Ö 200 100

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):

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### 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).

Part # 57048

2 of 2



### 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

Catalog Number: CHEM-CLP-4
Lot Number: S2-MEB711673
Matrix: 3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Boron, B  $1\ 000\pm 6\ \mu g/mL$  Molybdenum, Mo  $1\ 000\pm 6\ \mu g/mL$  Silicon, Si  $1\ 000\pm 7\ \mu g/mL$  Tin, Sn  $1\ 000\pm 6\ \mu g/mL$ 

Titanium, Ti  $1000 \pm 7 \mu g/mL$ 

**Density:** 1.030 g/mL (measured at 20  $\pm$  4 °C)

### **Assay Information:**

| 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   |
| 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 Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where two or more methods of characterization are 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: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub> Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u<sub>char a</sub> = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM}$ = k ( $u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$ )<sup>1/2</sup> CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u<sub>char a</sub> = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty u<sub>lts</sub> = long term stability standard uncertainty (storage) u<sub>lts</sub> = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u<sub>ts</sub> = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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

- 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 <a href="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a> **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; inorganic ventures.com; info@inorganic ventures.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

- Sealed TCT Rag Open Date:

- 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

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|------------------------------|-----------------------------------|--------------------|-----------|
|                              |                                   |                    |           |
| This CDM/DM should not be us | and langer than one year (or give | months in the case | of a 20 m |

- Inis 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.

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Director, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

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 Solution

Catalog Number: CLPP-CAL-1

Lot Number: T2-MEB714417

Matrix: 5% (v/v) HNO3

Value / Analyte(s): 5 000 µg/mL ea:

Calcium, Potassium, Magnesium, Sodium,

2 000 µg/mL ea:

Aluminum, Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese, 250 μg/mL ea:

Silver, Copper,

200 μg/mL ea: Chromium, 50 μg/mL ea: Beryllium

### 3.0 CERTIFIED VALUES 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  $20 \pm 4$  °C)

### **Assay Information:**

| 13. | ssay information. |             |           |              |  |  |  |
|-----|-------------------|-------------|-----------|--------------|--|--|--|
|     | ANALYTE           | METHOD      | NIST SRM# | SRM LOT#     |  |  |  |
|     | Ag                | ICP Assay   | 3151      | 160729       |  |  |  |
|     | Ag                | Volhard     | 999c      | 999c         |  |  |  |
|     | Al                | ICP Assay   | 3101a     | 140903       |  |  |  |
|     | Al                | 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 |  |  |  |
|     | Ca                | ICP Assay   | 3109a     | 130213       |  |  |  |
|     | Ca                | EDTA        | 928       | 928          |  |  |  |
|     | Co                | ICP Assay   | 3113      | 190630       |  |  |  |
|     | Co                | 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          |  |  |  |
|     | K                 | ICP Assay   | 3141a     | 140813       |  |  |  |
|     | K                 | 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 Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where two or more methods of characterization are 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: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub> Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u<sub>char a</sub> = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = [\Sigma((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u<sub>char a</sub> = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) u<sub>lts</sub> = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u<sub>ts</sub> = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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

- 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 <a href="https://www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

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:   |  |
|-----------------------------|--|
| · Sealeo TCT Bao Oberi Dale |  |

- 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

DD9784.



### 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

CLPP-CAL-3 Catalog Number: T2-MEB714159 Lot Number: Matrix: 7% (v/v) HNO3 Value / Analyte(s):

> Arsenic, Lead, Selenium, Thallium,

500 µg/mL ea: Cadmium

1 000 µg/mL ea:

### 3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

**ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE** 1 000 ± 8 µg/mL Cadmium, Cd  $500.0 \pm 2.1 \,\mu g/mL$ Arsenic, As Lead, Pb 1 000 ± 5 µg/mL Selenium, Se 1 000 ± 8 µg/mL

Thallium, TI 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   |
| TI      | 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 Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where two or more methods of characterization are 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: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub> Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u<sub>char a</sub> = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u<sub>char a</sub> = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) u<sub>lts</sub> = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u<sub>ts</sub> = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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

- 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

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

### 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

| <ul> <li>Sealed TCT Bag C</li> </ul> | pen 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

20178Ci

### 800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



# Certified Reference Material CRM

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

R: 815/24 M6025

CERTIFIED WEIGHT REPORT: Part Number: 57182 110923 Solvent: 24002546 Lot #

Nitric Acid

Lot Number: Description: Lead (Pb)

Nominal Concentration (µg/mL): Recommended Storage: 10000 Ambient (20 °C)

**Expiration Date:** 

110926

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

110923

Revience

40.0

Weight shown below was diluted to (mL): **NIST Test Number: 6UTB** Lot 2000.02 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Actual Actual Uncertainty Reviewed By: Expanded Pedro L. Rentas SDS information

| [ F.]             | 1. Lead(II) nitrate (Pb)               | Compound   |
|-------------------|--|--|
| [1] Spectrum No.1 | IN029 PBD122016A1                      | Lot Nominal Purity Uncertainty Assay Target Actual RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) |
| 17.284 5          | 11                                     | Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) \(\begin{array}{c}\)                               |
| 7                 | 99.999                                 | Purity<br>(%)  |
| של מו             | 0.10                                   | Uncertainty<br>Purity (%)  |
|                   | 62.5                                   | Assay<br>(%)   |
| 7 I I             | 32.0006                                | Target<br>Weight (g)   |
|                   | 10000 99.999 0.10 62.5 32.0006 32.0040 | Actual<br>Weight (g)   |
|                   |  | Actual<br>Conc. (µg/mL)  |
|                   | 20.0                                   | Actual Uncertainty onc. (µg/mL) +/- (µg/mL)  |
|                   | 10099-74-8                             | (Solv  |
|                   | 10001.1 20.0 10099-74-8 0.05 mg/m3     | Actual Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (ug/mL) +/- (ug/mL) CAS# OSHA PEL (TWA) LD50         |
|                   | intryns-rat 93 mg/kg 3128              | tached pg.)<br>LD50  |
|                   | 3128                                   | NIST<br>SRM  |

| 110 120 130 140 150 | 10 20 30 40 |  |
|---------------------|-------------|--|
| 120 130 140         | 20 30       |  |
| 120 130 140         | 30          |  |
| 130                 | 30          |  |
| 130                 |             |  |
| 140                 |             |  |
|                     | 8           |  |
|                     | 6           |  |
| o d                 |             |  |
| di<br>O             |             |  |
|                     | <b>5</b>    |  |
|                     |             |  |
| 60                  | 6).<br>O    |  |
| -4                  |             |  |
| 170                 | 70          |  |
| 14<br>00            | 80          |  |
| 180                 |             |  |
| 19<br>0             | 9           |  |
| 0                   | 90          |  |
| 200                 | 100         |  |

Part # 57182

1 of 2



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

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

|               |                         |                              | _   |  | 20.02   | 2  | 70.02   |
|---------------|-------------------------|------------------------------|---|--|---|--|---|
|               |                         |                              |   |  | 3   | ?  | 3   |
| <0.02 Pt      |                         |                              |   |  | 40.02   | S  | 40.02   |
|               |                         |                              |   |  | 40.02   | , t  | <u> </u>  |
|               |                         |                              |   |  | A.12  | S  | 20.02   |
|               |                         |                              | _   |  | A0.02   | , E  | 8 2   |
|               |                         |                              |   |  | <b>A</b>  | <u></u>  | 20.02   |
|               |                         |                              |   |  | 40.02   | . E  | 20.02   |
| 7 7 Z Q Z 7 3 | 40.02<br>40.02<br>40.02 | Mg 40.02  Hg 40.02  Hg 40.02 | 40.02 Lu 40.02 40.02 Mg 40.01 40.02 Mg 40.02 40.02 Mg 40.02 | Ho 4002 Lu 4002 Li 4002 Mg 4001 Li 4002 Mg 4001 Li 4002 Mg 402 Fe 402 Hg 402 | 40.02 Lu 40.02 40.02 Mg 40.01 40.02 Mg 40.02 40.02 Mg 40.02 | 4002 Ho 4002 Lu 4002 4002 In 4002 Mg 4001 4002 Fe 402 Hg 402 | Er 4002 Ho 4002 Lu 4002 Eu 4002 In 4002 Mg 4001 Gd 4002 Ir 4002 Mn 4002 Ga 4002 Fe 402 Hg 402 |

## Physical Characterization:

(T)= Target analyte

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

Son I Mills

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).





### 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.

**CAUTION:** 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: Al, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,







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

### 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. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211, |
|--|
| AND ICSA-1211 MIXED WITH ICSB-0710   |

| 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) |
|---------|------|------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
| Al      | 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                     |
| Ba      | 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                    |
| Ca      | 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                    |

ICSA M5126 M5127 M5128 M5129 M5130

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.

value  $\pm$  15 percent of the listed certified value.

**ICSB** 

M5219

M5220

M5221

M5222

M5223



### 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

Catalog Number: CHEM-QC-4

Lot Number: S2-MEB711674

Matrix: 3% (v/v) HNO3
 3% (v/v) HF

3 /0 (V/V) I II

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

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

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Boron, B  $1\,000\pm7\,\mu\text{g/mL}$  Molybdenum, Mo  $1\,000\pm5\,\mu\text{g/mL}$  Silicon, Si  $1\,000\pm7\,\mu\text{g/mL}$  Tin, Sn  $1\,000\pm5\,\mu\text{g/mL}$ 

Titanium, Ti  $1 001 \pm 6 \mu g/mL$ 

**Density:** 1.032 g/mL (measured at 20  $\pm$  4 °C)

### **Assay Information:**

| 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   |
| 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 Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where two or more methods of characterization are 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: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub> Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u<sub>char a</sub> = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM}$ = k ( $u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$ )<sup>1/2</sup> CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u<sub>char a</sub> = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty u<sub>lts</sub> = long term stability standard uncertainty (storage) u<sub>lts</sub> = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u<sub>ts</sub> = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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

- 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 <a href="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a> **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; inorganic ventures.com; info@inorganic ventures.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

- Sealed TCT Rag Open Date:

- 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

| could for bug opon buto.     |                                  | •                         |      |
|------------------------------|----------------------------------|---------------------------|------|
|                              |                                  |                           |      |
| This CDM/DM should not be up | and langer than one year for six | months in the case of a 2 | n ml |

- I his 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.

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Director, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

Paul R Laine





### 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.

**CAUTION:** 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: Al, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,







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

### 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. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211, |
|--|
| AND ICSA-1211 MIXED WITH ICSB-0710   |

| 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) |
|---------|------|------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
| Al      | 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                     |
| Ba      | 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                    |
| Ca      | 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                    |

ICSA M5126 M5127 M5128 M5129 M5130

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.

value  $\pm$  15 percent of the listed certified value.

**ICSB** 

M5219

M5220

M5221

M5222

M5223

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Part # 58113



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

| 7 | Tb   <0.02   W   |
|---|--|
| _ | A<br>0.02  |
|   |  |
|   | 3 :  |
|   | 3 1  |
|   | 2 :  |
|   | Ti <0.02 Zr  |
|   | Se <0.2 Si <0.02 Ag <0.02 Na <0.02 Si <0.02 Si <0.02 Ag <0.02 Si <0.02 |

Physical Characterization:

(I)= larger analyte

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).

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Part # 58113



### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R: 4120/21

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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.

**CAUTION:** 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 µg/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% (y/y) nitric acid.

Page 1 of 2



RMs ICV 1, 5, 6 SFAM.docx



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

### Instructions for QATS Reference Material: Inorganic ICV Solutions

ICV1-1014

For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.

ICV5-0415

For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and 5% (v/v) nitric acid.

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K<sub>3</sub>Fe(CN)<sub>6</sub>, Type II water, and 0.1 % sodium hydroxide, and will 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) (after 10-fold dilution) | Concentration (µg/L)<br>(after 50-fold dilution) |
| Al      | 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) (after 100-fold dilution) | Analyte   | Concentration (µg/L)<br>(after 100-fold dilution) |  |
| Hg      | 4.0  | CN-       | 99  |  |

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CERTIFIED WEIGHT REPORT:

Part Number:

57056

Solvent:

20510011

Nitric Acid

8

40.0

Nitric Acid

Description: Lot Number:

072122 Barium (Ba)

Certified Reference Material CRM

Riograph 33

Lot #

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

Formulated By: Liovannie Giovanni Esposito appeal 2

072122

Reviewed By: Pedro L. Rentas 072122

IN023 BAD022019A1 RM# Number 5 Conc. (µg/mL) Nominal 1000 99.999 Purity 8 Uncertainty Assay Purity (%) 0.10 52.3 <u>8</u> Weight (g) 3.82417 Target Weight (g) Conc. (µg/mL) 3.82426 Actual 1000.0 Actual +/- (µg/mL) Uncertainty Expanded 2.0 10022-31-8 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SDS Information 0.5 mg/m3 orl-rat 355 mg/kg 3104a SRM TSIN

1. Barium nitrate (Ba)

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 072125

**NIST Test Number:** 

Recommended Storage:

**Expiration Date:** 

Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

m/z-> **1/2-**2 17/2-Y 2.5E6 5.0E6 2.0E5 1.0ES 2.0E6 1.OE6 [1] Spectrum No.1 210 110 0 220 120 N O [ 12.514 sec]:58156.D# [Count] [Linear] 130 230 30 140 240 4 250 150 Ö. 160 260 00 170 8 180 80 190 90 200 100

## Certified Reference Material CRM



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

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

|          |       |    |       |    |  | •   | Traca M. | otolo | Varifica      | +ion  | ו מטן ייץ | 1 37 | 1  |     |       |     |       | l   |        |
|----------|-------|----|-------|----|--|-----|----------|-------|---------------|-------|-----------|------|--|-----|-------|-----|-------|-----|--------|
|          |       |    |       |    |  |     | 1        | נמונו | ۱^            |       | ביים עמ   | 2    | pg/mr)   |     |       |     |       |     |        |
|          |       |    |       |    | No. of Lot, House, etc., in case, or window, |     |          |       |               |       |           |      |  |     |       |     |       | ı   |        |
| IA<br>IA | <0.02 | ొ  | <0.02 | δ  | <0.02  | HF  | <0.02    | ï     | <0.02         | Z     | <0.02     | 占    | <0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.0 | 3   | 25.   | É   | 89    | 100 | 000    |
| Sb       | <0.02 | ටී | <0.2  | Ţ, | CD 02  | H   | 2007     | 1     | 2000          | 11.16 | 000       | £    |  | 3 8 | 1     | 2   | 70.02 | A   | 70.05  |
| A        | 4     | ,  | 100   | i  | 100  | 2   | 70.00    | 7     | 70.0>         | D.    | 70.02     | 2    | 40.02  | 2   | <0.02 | E . | <0.05 | ם   | <0.02  |
| AS       | 7.02  | 3  | Z0:07 | 2  | <0.02  | 드   | <0.02    | Mg    | <b>₹0.0</b> 1 | ő     | <0.02     | Rh   | <0.00  | Ag  | 2007  | F   | 50 9  | 77  | 6      |
| Ha       | €     | ێ  | 2002  | 3  | 5000   | ,1  | 000      | >     | 200           | i     |           | 1    | ***************************************                      | 0   | 70.05 | 1   | 70.07 | >   | 70:05  |
|          | 4     | 3  | *0.00 | 3  | 7000   | =   | 70.05    | IMIM  | 70:0>         | 2     | <0.02     | Rb   | Q.02   | Z   | 8     | Ę   | 200   | 5   | 2007   |
| Be       | <0.01 | Ö  | <0.02 | Ğ  | <0.02  | Ę.  | <0.2     | Ho    | <0.2          | ۵     | 200       | å    | 6  | į,  | 1 6   | Ę   | 0.00  | ; ; | 70:05  |
| ä        | 200   | ځ  | 0000  | Č  | 000  | ,   |          | 0 ,   |               |       | 10.04     | 7    | 70.07  | วี  | 70'05 | E   | 70.05 | >-  | \$0.05 |
| 7        | 70.07 | 3  | Z0.02 | 5  | 20102  | 2   | 40.02    | Wo    | ₹0.05         | Ž,    | <0.02     | Sm   | <0.02  | v.  | 2002  | Ca  | 2000  | 7   | 000    |
| 20       | Q0.05 | Č  | <0.00 | Ап | 200  | á   | 200      | FIN   | 000           | 2     | 0         | 7    |  | ,   | 10:00 | 2   | 70:07 | 77  | 70.02  |
| 1        |       |    | 2010  |    | 7000   | 7 0 | 70.05    | DAT   | Z0:0>         | 4     | 787       | S    | <0.02  | 2   | 202   | Ë   | 200   | ,   | 5000   |

Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

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

<sup>\*</sup> 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).

<sup>\*</sup> All Standards should be stored with caps tight and under appropriate laboratory conditions. Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

<sup>\*</sup> 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 Deference Metaric Com

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Certified Reference Material CRM
[N 403 | 20 | 128 | 125 | 1

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

070622 070622 Pedro L. Rentas Lawrence Barry Formulated By: Reviewed By: Nitric Acid Nitric Acid 20510011 Fot # 20.0 (mL) Solvent: 2% 0.058 Flask Uncertainty 5E-05 Balance Uncertainty 1000.12 Ambient (20 °C) Lithium (Li) Weight shown below was diluted to (mL): 57103 070622 070625 10000 **6UTB** Nominal Concentration (µg/mL): NIST Test Number: Lot Number: Description: Expiration Date: Recommended Storage: Part Number: CERTIFIED WEIGHT REPORT:

| Γ   |  |   |           |             |               | ar]        | [ 9.619 sec]:58103.D# [Count] [Linear] | # [C  | 58103.D                                 | sec]:: | _               | No.1             | ctrum | [1] Spectrum No.1 |                      |
|-----|--|---|-----------|-------------|---------------|------------|--|-------|---|--------|-----------------|------------------|-------|-------------------|----------------------|
| 5   | Byfill 0241 ischio   | 2   |           |             |               |            | 1                                      |       |   |        |                 |                  |       |                   |                      |
| MA  | 0.10 10.0 100.0134 100.0173 10000.4 20.0 7790-69-4 5 ma/m3 nd-sat 1428 ma/m NA | 5 ma/m3   | 7790-69-4 | 20.0        | 10000.4       | 100.0173   | 100.0134                               | 10.0  | 0.10                                    | 99.999 | 10000 89.889 0. | IN019 UZ042018A1 | IN019 |                   | Lithium nitrate (Li) |
| SEM | LD50   | RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 | CAS#      | +/- (ug/mL) | Conc. (ug/mL) | Weight (g) | Weight (g)                             | (%)   | Purity (%)                              | (%)    | Conc. (µg/mL)   | Number           | RM#   |                   | БПроппа              |
|     | Attached oc.)  | (Solvent Safety Info. On Attached pg.)  | (Solv     | Uncertainty | Actual        | Actual     | Target                                 | Assay | Nominal Punty Uncertainty Assay. Target | Funty  | Nominal         | 707              |       |                   | Commonia             |
|     | ition  | SDS Information   |           | Expanded    |               |            |  |       |   |        |                 | -                |       |                   |                      |

| 1.056                                | 6.0E5 | m/z->-<br>500<br>250 | 7,2-7<br>20<br>10 | m/z->  |
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# Certified Reference Material CRM



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

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

|             |              |  |                                      |    |               |    | Trace Me     | stale  | Varifics     | tion | hy ICP.      | MC      | ( lm/m/)     |     |       |                |       |          |       |
|-------------|--------------|--|--------------------------------------|----|---------------|----|--------------|--------|--------------|------|--------------|---------|--------------|-----|-------|----------------|-------|----------|-------|
| SHIPPING IN |              | STREET, STREET | THE RESIDENCE OF THE PERSON NAMED IN |    |               | -  | THE PARTY    |        | 2011124      |      | 1            | 2       | (M)          |     |       |                |       |          |       |
| A1          | 2002         | 3  | 2000                                 | 2  | 88            | 30 | 800          | E      | F            | 1    | 89           | 4       |              | I.  | -     |                |       |          |       |
| 2 :         | 70'00        | 3  | 70.00                                | 5  | 70.02         | 1  | 70105        | 3      | 1            | Σ,   | 70.02        | =       | Z0:02        | 3   | 40.2  | 19             | Ø.02  | <b>≥</b> | 40.02 |
| 3           | <0.02        | రి   | 40.2                                 | 山  | <0.02         | Ho | <b>40.02</b> | Ē      | <b>40.02</b> | ź    | <b>40.02</b> | 2       | <b>Q</b> .02 | SS: | <0.02 | T <sub>e</sub> | <0.02 | ח        | <0.02 |
| As          | ₩2           | ප  | <0.02                                | 嵒  | <0.02         | 편  | <b>₹0.02</b> | Mg     | <0.01        | ő    | <0.02        | Rh<br>A | <0.02        | Ag  | <0.02 | E              | <0.02 | >        | Ø 02  |
| Ba          | <0.02        | రో   | <0.02                                | 3  | <0.02         | 卢  | <0.02        | Mn     | <0.02        | R    | ZO:02        | 2       | Ø.02         | Z   | 40.2  | £              | 200   | \$       | 500   |
| Be          | <0.01        | ඊ  | <0.02                                | පී | <b>40.02</b>  | 괊  | <0.2         | 黑      | \$07         | Δ.   | <0.02        | Ra      | 900          | J.  | <0.02 | ع ا            | 8     | <b>*</b> | 200   |
| B.          | <b>40.02</b> | රි   | <b>40.02</b>                         | පී | <b>20.0</b> 2 | 3  | <0.02        | ₩<br>W | <b>40.02</b> | Æ    | <0.02        | SB      | <0.02        | S   | <0.05 | 5              | 8     | - E      | 200   |
| В           | <0.02        | ರೆ   | <0.02                                | Αn | <0.02         | 2  | <0.02        | P      | <0.02        | 24   | <0.2         | S       | <b>40.02</b> | E   | <0.02 | E              | 000   | 7 12     | 200   |

Physical Characterization:

(T)= Target analyte

Certified by:

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

All standard containers are meticulously cleaned prior to use. the preparation of all standards.

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 # 57103

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



ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com 031523 031523 Giovanni Esposito Pedro L. Rentas Liovanni Formulated By: Reviewed By: Certified Reference Material CRM Nitric Acid Nitric Acid Solvent: 21110221 Lot # 60.0 (mL) % 5E-05 Balance Uncertainty 0.058 Flask Uncertainty 3000.41 Ambient (20 °C) Calcium (Ca) Weight shown below was diluted to (mL): 031523 031526 10000 **6UTB** Recommended Storage: Nominal Concentration (µg/mL): Part Number: Lot Number: Description: **Expiration Date:** NIST Test Number: CERTIFIED WEIGHT REPORT:

| Compound                  | RM#               | Lot<br>Number     | Nominal Purity<br>Conc. (µg/mL) (%) | Punty<br>(%) | Purity Uncertainty Assay<br>(%) Purity (%) (%) |          | Target<br>Weight (g) | Actual<br>Weight (g) | Expanded Actual Actual Uncertainty (Sc Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# | Expanded Uncertainty +/- (ug/mL) | (Solv    | SDS Information (Solvent Safety Info. On Attached pg.)  NS# OSHA PEL (TWA) LD50 | Attached pg.)<br>LD50 | NIST  |
|---------------------------|-------------------|-------------------|-------------------------------------|--------------|--|----------|----------------------|----------------------|--|----------------------------------|----------|---|-----------------------|-------|
| 1. Calcium carbonate (Ca) | IN014             | INO14 caboragezat | 10000 99.999                        | 666.66       | 0.10   | 38.9     | 75.1990              | 75.2093              | 10001.4  | 20.0                             | 471-34-1 | 5 mg/m3   | ort-rat               | 3109a |
| [1] S <sub>1</sub>        | [1] Spectrum No.1 |                   | 4.00                                | 8ec]:6       | 12.514 sec]:58120.D# [Count] [Linear]          | <u> </u> | unti (Line           | ari                  |  |                                  |          |   |                       |       |
| 1.0E4                     |                   |                   |                                     |              |  |          |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 0                 | .0                |                                     | 000          | .0   | 400400   | 0                    | 0                    | 2  |                                  | 0        |   | 001                   |       |
| 2.<br>4<br>4              |                   |                   |                                     |              |  |          |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 0                 | 120               |                                     | 90           | 140  |          | 150                  | 160                  | 071  | 0                                | 180      | 190   |                       |       |
| 6.0E4                     |                   |                   |                                     |              |  |          |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 019               | 220               |                                     | 230          | 240  |          | 250                  | 260                  |  |                                  |          |   |                       |       |





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

|            |  |              |             |                                       |  | Trace Me         | tals      | Verificat       | ioi      | by ICP-N | MS (  | $(\mu g/m\Gamma)$  |  | r  |  |  |  |  |
|------------|--|--------------|-------------|---------------------------------------|--|------------------|-----------|-----------------|----------|----------|---|--|--|--|--|--|--|--|
| SHEW SHEET | STATE OF THE PARTY OF                        |              |             |                                       | SIGNATURE .  | STON SAFETY SAGE | S. Parlie | THE SHARE SHARE | Series . |          | Sec.  | STREET, STREET | THE PERSON   | THE PERSON NAMED IN  | THE PERSON   |  |  |  |
| 707        | ප  | <0.02        | δ           | 40.05                                 | H  | <0.02            | II.       | <0.02           | Z        | <0.02    | ď   | <0.02  | Se   | <0.2   | 13   | <0.02  | ≥  | <0.02  |
| 700        | రో   | H            | 卢           | ₹0.02                                 | 윒  | 20.02            | 3         | <0.02           | ź        | <0.02    | 2   | <0.02  | ន  | <0.02  | Į.   | 40.02  | Þ  | ₹0.05  |
| 07         | පී   | <b>40.02</b> | 超           | <0.02                                 | Я  | <0.02            | Mg        | 40.01           | ő        | <0.02    | 쥪   | <0.02  | Ag   | <0.02  | F  | <0.02  | >  | <0.02  |
| 707        | ర  | <0.02        | පි          | <0.02                                 | 片  | <0.02            | Mn        | <0.02           | Z        | <0.02    | 2   | <0.02  | ž  | <0.2   | Ę  | <0.02  | ¥9   | 40.02  |
| 100        | Ö  | <0.02        | ජි          | 40.02                                 | Ŗ  | <0.2             | Hg        | 40.2            | م        | <0.02    | æ   | <0.02  | స  | <0.02  | Ę,   | <0.02  | ¥  | ₹0.05  |
| 707        | රි   | 40.02        | පි          | ₹0.02                                 | 3  | ₹0.02            | Wo        | <0.02           | 五        | <0.02    | Sm  | <0.02  | S  | <0.02  | Sn   | <0.02  | 2  | ₹0.02  |
| 707        | ♂  | <0.02        | Αū          | <0.02                                 | 2  | <0.02            | PN        | <0.02           | ×        | 40.2     | S   | <0.02  | Ta   | <0.02  | Ξ  | <0.02  | Z  | 40.02  |
|            | 6.00<br>6.00<br>6.00<br>6.00<br>6.00<br>6.00 |              | 3 5 5 5 5 5 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | Cd               | Cd        | Cd              | Cd       | Cd       | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02           Ca         T         En         -0.02         Ho         -0.02         Li         -0.02           Ce         -0.02         Eu         -0.02         in         -0.02         Mg         -0.02           Cr         -0.02         Gd         -0.02         Fe         -0.02         Mn         -0.02           Co         -0.02         Ge         -0.02         Fe         -0.02         Mo         -0.02           Cu         -0.02         Au         -0.02         Fe         -0.02         Mo         -0.02 | Cd         -60.02         Dy         -60.02         Hf         -60.02         Li         -60.02         Ni           Ca         T         En         -60.02         Ho         -60.02         Lu         -60.02         Nh           Ca         -60.02         Eu         -60.02         In         -60.02         Mn         -60.02         Pd           Cr         -60.02         Ga         -60.02         Fe         -60.2         Hg         -60.2         Pr           Co         -60.02         Ga         -60.02         La         -60.02         Rr         -60.02         Rr           Cu         -60.02         Au         -60.02         Pr         -60.02         Rr   | Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002           Ca         T         En         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002           Ce         -6.002         Eu         -6.002         In         -6.002         Mg         -6.012         Nh         -6.002           Cr         -6.002         Gd         -6.002         Fe         -6.02         Mn         -6.02         Pd         -6.02           Cr         -6.002         Gg         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02           Cu         -6.002         Au         -6.002         Nr         -6.002         R         -6.002           Cu         -6.002         Au         -6.002         Nr         -6.002         R         -6.002 | Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002         Pr           Ca         T         Ea         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002         Rb           Ce         -6.002         Eu         -6.002         Ir         -6.002         Mn         -6.002         Rb         -6.002         Rb           Cr         -6.002         Ga         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02         Ru           Co         -6.002         Ga         -6.002         La         -6.002         Rr         -6.002         Rr           Co         -6.002         Ga         -6.002         Pr         -6.002         Rr         -6.002         Sr           Cu         -6.002         Au         -6.002         Pr         -6.002         Rr         -6.002         Sr | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02           Ca         T         Ba         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02           Ce         -0.02         Bu         -0.02         Ir         -0.02         Mg         -0.01         Os         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Mn         -0.02         Pr         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02 | Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Re         -d002         Si           Ca         T         Ea         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Re         -d002         Si           Ca         -d002         Ea         -d002         Hr         -d002         Mn         -d002         Rh         -d002         Na           Ca         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Ru         -d002         Na           Ca         -d002         Ga         -d002         Hg         -d002         Pr         -d002         Sn         -d002         Sr           Ca         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sn         -d002         Sr         -d002         Sr           Ca         -d002         Au         -d002         Nd         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr         -d002         Sr         -d002         Sr         -d002 | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02         Se         -0.02           Ca         T         Eu         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02         Si         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Ca         -0.02         Gd         -0.02         Ir         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Ca         -0.02         Ga         -0.02         Hg         -0.02         Ru         -0.02         Sr         -0.02           Ca         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Ca         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Ca         -0.02         Au         -0.02         Rr         -0.02         Sr | Cd         4002         Dy         4002         H         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Th           Ca         T         Ea         4002         Ha         4002         Lu         4002         Nb         4002         Rb         4002         Tr           Ca         4002         Eu         4002         Ha         4002         Pd         4002         Rb         4002         Tr           Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Sr         4002         Tr          Cr         4002         Au         4002         Rr         4002         Rr         4002         Sr         4002         Sr         4002           Cu         4002         Au         4002         Rr         4002         Rr         4002 |

(T) = Target analyte

## Physical Characterization:

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



Certified by:

<sup>\*</sup> 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. the preparation of all standards.

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.

<sup>\*</sup> 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.

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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com 031523 031523 Giovanni Esposito Pedro L. Rentas Liovanni Formulated By: Reviewed By: Certified Reference Material CRM Nitric Acid Nitric Acid Solvent: 21110221 Lot # 60.0 (mL) % 5E-05 Balance Uncertainty 0.058 Flask Uncertainty 3000.41 Ambient (20 °C) Calcium (Ca) Weight shown below was diluted to (mL): 031523 031526 10000 **6UTB** Recommended Storage: Nominal Concentration (µg/mL): Part Number: Lot Number: Description: **Expiration Date:** NIST Test Number: CERTIFIED WEIGHT REPORT:

| Compound                  | RM#               | Lot<br>Number     | Nominal Purity<br>Conc. (µg/mL) (%) | Punty<br>(%) | Purity Uncertainty Assay<br>(%) Purity (%) (%) |          | Target<br>Weight (g) | Actual<br>Weight (g) | Expanded Actual Actual Uncertainty (Sc Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# | Expanded Uncertainty +/- (ug/mL) | (Solv    | SDS Information (Solvent Safety Info. On Attached pg.)  NS# OSHA PEL (TWA) LD50 | Attached pg.)<br>LD50 | NIST  |
|---------------------------|-------------------|-------------------|-------------------------------------|--------------|--|----------|----------------------|----------------------|--|----------------------------------|----------|---|-----------------------|-------|
| 1. Calcium carbonate (Ca) | IN014             | INO14 caboragezat | 10000 99.999                        | 666.66       | 0.10   | 38.9     | 75.1990              | 75.2093              | 10001.4  | 20.0                             | 471-34-1 | 5 mg/m3   | ort-rat               | 3109a |
| [1] S <sub>1</sub>        | [1] Spectrum No.1 |                   | 4.00                                | 8ec]:6       | 12.514 sec]:58120.D# [Count] [Linear]          | <u> </u> | unti (Line           | ari                  |  |                                  |          |   |                       |       |
| 1.0E4                     |                   |                   |                                     |              |  |          |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 0                 | .0                |                                     | 000          | .0   | 400400   | 0                    | 0                    | 2  |                                  | 0        |   | 001                   |       |
| 2.<br>4<br>4              |                   |                   |                                     |              |  |          |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 0                 | 120               |                                     | 90           | 140  |          | 150                  | 160                  | 071  | 0                                | 180      | 190   |                       |       |
| 6.0E4                     |                   |                   |                                     |              |  |          |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 019               | 220               |                                     | 230          | 240  |          | 250                  | 260                  |  |                                  |          |   |                       |       |





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

|            |  |              |             |                                       |  | Trace Me         | tals      | Verificat       | ioi      | by ICP-N | MS (  | $(\mu g/m\Gamma)$  |  | r  |  |  |  |  |
|------------|--|--------------|-------------|---------------------------------------|--|------------------|-----------|-----------------|----------|----------|---|--|--|--|--|--|--|--|
| SHEW SHEET | STATE OF THE PARTY OF                        |              |             |                                       | SIGNATURE .  | STON SAFETY SAGE | S. Parlie | THE SHARE SHARE | Series . |          | Sec.  | STREET, STREET | THE PERSON   | THE PERSON NAMED IN  | THE PERSON   |  |  |  |
| 707        | ප  | <0.02        | δ           | 40.05                                 | H  | <0.02            | II.       | <0.02           | Z        | <0.02    | ď   | <0.02  | Se   | <0.2   | 13   | <0.02  | ≥  | <0.02  |
| 700        | రో   | H            | 卢           | ₹0.02                                 | 윒  | 20.02            | 3         | <0.02           | ź        | <0.02    | 2   | <0.02  | ន  | <0.02  | Į.   | 40.02  | Þ  | ₹0.05  |
| 07         | පී   | <b>40.02</b> | 超           | <0.02                                 | Я  | <0.02            | Mg        | 40.01           | ő        | <0.02    | 쥪   | <0.02  | Ag   | <0.02  | F  | <0.02  | >  | <0.02  |
| 707        | ర  | <0.02        | පි          | <0.02                                 | 片  | <0.02            | Mn        | <0.02           | Z        | <0.02    | 2   | <0.02  | ž  | <0.2   | Ę  | <0.02  | ¥9   | 40.02  |
| 100        | Ö  | <0.02        | ජි          | 40.02                                 | Ŗ  | <0.2             | Hg        | 40.2            | م        | <0.02    | æ   | <0.02  | స  | <0.02  | Ę,   | <0.02  | ¥  | ₹0.05  |
| 707        | රි   | 40.02        | පි          | ₹0.02                                 | 3  | ₹0.02            | Wo        | <0.02           | 五        | <0.02    | Sm  | <0.02  | S  | <0.02  | Sn   | <0.02  | 2  | ₹0.02  |
| 707        | ♂  | <0.02        | Αū          | <0.02                                 | 2  | <0.02            | PN        | <0.02           | ×        | 40.2     | S   | <0.02  | Ta   | <0.02  | Ξ  | <0.02  | Z  | 40.02  |
|            | 6.00<br>6.00<br>6.00<br>6.00<br>6.00<br>6.00 |              | 3 5 5 5 5 5 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | Cd               | Cd        | Cd              | Cd       | Cd       | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02           Ca         T         En         -0.02         Ho         -0.02         Li         -0.02           Ce         -0.02         Eu         -0.02         in         -0.02         Mg         -0.02           Cr         -0.02         Gd         -0.02         Fe         -0.02         Mn         -0.02           Co         -0.02         Ge         -0.02         Fe         -0.02         Mo         -0.02           Cu         -0.02         Au         -0.02         Fe         -0.02         Mo         -0.02 | Cd         -60.02         Dy         -60.02         Hf         -60.02         Li         -60.02         Ni           Ca         T         En         -60.02         Ho         -60.02         Lu         -60.02         Nh           Ca         -60.02         Eu         -60.02         In         -60.02         Mn         -60.02         Pd           Cr         -60.02         Ga         -60.02         Fe         -60.2         Hg         -60.2         Pr           Co         -60.02         Ga         -60.02         La         -60.02         Rr         -60.02         Rr           Cu         -60.02         Au         -60.02         Pr         -60.02         Rr   | Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002           Ca         T         En         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002           Ce         -6.002         Eu         -6.002         In         -6.002         Mg         -6.012         Nh         -6.002           Cr         -6.002         Gd         -6.002         Fe         -6.02         Mn         -6.02         Pd         -6.02           Cr         -6.002         Gg         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02           Cu         -6.002         Au         -6.002         Nr         -6.002         R         -6.002           Cu         -6.002         Au         -6.002         Nr         -6.002         R         -6.002 | Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002         Pr           Ca         T         Ea         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002         Rb           Ce         -6.002         Eu         -6.002         Ir         -6.002         Mn         -6.002         Rb         -6.002         Rb           Cr         -6.002         Ga         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02         Ru           Co         -6.002         Ga         -6.002         La         -6.002         Rr         -6.002         Rr           Co         -6.002         Ga         -6.002         Pr         -6.002         Rr         -6.002         Sr           Cu         -6.002         Au         -6.002         Pr         -6.002         Rr         -6.002         Sr | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02           Ca         T         Ba         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02           Ce         -0.02         Bu         -0.02         Ir         -0.02         Mg         -0.01         Os         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Mn         -0.02         Pr         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02 | Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Re         -d002         Si           Ca         T         Ea         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Re         -d002         Si           Ca         -d002         Ea         -d002         Hr         -d002         Mn         -d002         Rh         -d002         Na           Ca         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Ru         -d002         Na           Ca         -d002         Ga         -d002         Hg         -d002         Pr         -d002         Sn         -d002         Sr           Ca         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sn         -d002         Sr         -d002         Sr           Ca         -d002         Au         -d002         Nd         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr         -d002         Sr         -d002         Sr         -d002 | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02         Se         -0.02           Ca         T         Eu         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02         Si         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Ca         -0.02         Gd         -0.02         Ir         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Ca         -0.02         Ga         -0.02         Hg         -0.02         Ru         -0.02         Sr         -0.02           Ca         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Ca         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Ca         -0.02         Au         -0.02         Rr         -0.02         Sr | Cd         4002         Dy         4002         H         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Th           Ca         T         Ea         4002         Ha         4002         Lu         4002         Nb         4002         Rb         4002         Tr           Ca         4002         Eu         4002         Ha         4002         Pd         4002         Rb         4002         Tr           Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Sr         4002         Tr          Cr         4002         Au         4002         Rr         4002         Rr         4002         Sr         4002         Sr         4002           Cu         4002         Au         4002         Rr         4002         Rr         4002 |

(T) = Target analyte

## Physical Characterization:

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



Certified by:

<sup>\*</sup> 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. the preparation of all standards.

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.

<sup>\*</sup> 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.

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| 800-368-1131<br>www.absolutestandards.com                      | 100                 | <u> </u>                     |   | •                   | Sertified .                                       | Refere    | Since Mai            | Certified Reference Material CRM  | 1/203 ( | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ |                                 | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | ANAB ISO 17034 Accredited AR-1539 Certificate Number ttps://Absolutestandards.com | credited<br>Number<br>rds.com |
|--|---------------------|------------------------------|---|---------------------|---|-----------|----------------------|---|---------|--|---------------------------------|--|---|-------------------------------|
| CERTIFIED WEIGHT REPORT:                                       |                     |                              |   |                     |   | 1         | Lot#                 |   |         | る                                      |                                 |  |   |                               |
| Fart Number: Lot Number: Description:                          |                     | 57182<br>061522<br>Lead (Pb) |   |                     | Solvent:  |           | 20510011             | Nitric Acid   |         | Hieram                                 | ranvie Ed                       | peate  |   |                               |
| Expiration Date:   |                     | 081525                       |   |                     |   | %         | 40.0                 | Nitric Acid   |         | Formulated By:                         | Giovann                         | Giovanní Esposito  | 061522  |                               |
| Recommended Storage: Nominal Concentration (µg/mL):            |                     | Ambient (20 °C)<br>10000     | Ő   |                     |   |           | (TE)                 |   |         | Ph                                     | H.                              | C/S  |   |                               |
| NIST Test Number: 6UTB Weight shown below was diluted to (mL): | r: 6U<br>as diluted |                              | 2000.02   | 5E-05 B<br>0.058 FI | 5E-05 Balance Uncertainty 0.058 Flask Uncertainty | inty<br>f |                      |   |         | Reviewed By:                           | Pedro L                         | Pedro L. Rentas  | 061522  |                               |
| Compound   | RM#                 | Lot<br>Number C              | Lot Nominal Purity Uncertaint<br>Number Conc. (µg/ml.) (%) Purity (%) | Purity (            | ×   | - 1       | Target<br>Weight (g) | Expanded Actual Actual Uncertainty Weight (g) Conc. (µg/mL) +/- (µg/mL) | Actual  | Expanded Uncertainty (4+-(µg/mL) CAS#  | SD:<br>(Solvent Safe<br>S# OSHA | SDS information (Solvent Safety Info. On Attached pg.)  # OSHA PEL (TWA) LDSC            | l pg.)<br>LD50  | NIST                          |

SRM

| 1. Lead(II) nitrate (Pb) | INO29 PBD122016A1 | 10000                                 | 88.888 | 0.10  | 62.5     | 32.0006   | 32.0041 10001.1 |     | 20.0 | 10099-74-8 | 0.05 mg/m3 | intryne-rat 83 mo/kg 3128 | 3128 |
|--------------------------|-------------------|---------------------------------------|--------|-------|----------|-----------|-----------------|-----|------|------------|------------|---------------------------|------|
| 1.0E7                    | [1] Spectrum No.1 | 17.284 sec]:58182.D# [Count] [Linear] | ec]:58 | 82.D* | Cour     | nt] [Line |                 | 1   |      |            |            | p<br>h                    |      |
| S.0E8                    |                   |                                       |        |       |          |           |                 |     |      |            |            |                           |      |
| m/z->><br>2.0€6          | 0 P               | O                                     |        | .0    |          | 0.00      | 9               | 02  |      | 08         | 0          | 100                       |      |
| 1.0E6                    |                   |                                       |        |       |          |           |                 |     |      |            |            |                           |      |
| m/z->                    | 1100              | 190                                   |        | 04    | ri<br>Pr | 150       | 160             | 170 | , T  | 180        | 000        | 000                       |      |
| 5.0ES                    |                   |                                       |        |       |          |           |                 |     |      |            |            |                           |      |
| Å                        | 220               | 230                                   |        | 240   |          | 250       | 260             |     |      |            |            |                           |      |

Lot # 061522

# Certified Reference Material CRM



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

|           |                    |     |                |   |  | Ī  | Trace Me   | stals    | Verifica      | tion | by ICP-      | SM | (ma/m)       |                      | ,             |          |              |     |              |
|-----------|--------------------|-----|----------------|---|--|----|--|----------|---------------|------|--------------|----|--------------|----------------------|---------------|----------|--------------|-----|--------------|
| Section 1 | May be seen annual | į   | WORNING STREET | Name of Street, or other Persons and Street, | 3-5-40. 1. 1. 1. 3-2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. | -  | THE PROPERTY OF THE PARTY OF TH | CAMPBOOK |               |      |              |    | 2            | Commence of the last |               |          |              |     |              |
| ₹         | <0.02              | ਝ   | <0.02          | Ď   | <0.02  | HŁ | <0.02  | Ľ        | <0.02         | ž    | <0.02        | ď  | 2002         | 3                    | 202           | 4        | 200          |     | 000          |
| Sp        | <0.02              | ථ   | <0.2           | ď   | 200  | H  | 200  | ž        | 969           | 1    | 9            | è  | 2000         | 3                    | 100           | 2        | 20.02        | *   | 7mm>         |
| V V       | ç                  | d   | 1 6            | ,   |  | 2  | 777  | 3        | 70:05         | ON T | 70.02        | 2  | 7070>        | 7                    | ₹0.02         | <u>e</u> | \$0.02       | Þ   | <b>40.02</b> |
| ĉ         | 7.02               | 3   | Z0:02          | S S   | Q0:05  | 크  | 8002   | Mg       | <b>40.0</b> 1 | ර    | <b>40.02</b> | Rh | <b>40.02</b> | Ao                   | <b>CD CD</b>  | F        | 200          | 2   | 8            |
| Ba        | <0.02              | రో  | <0.02          | 3   | <0.02  | 4  | <0.02  | M        | <0.02         | Ъ    | 2002         | 40 | 8            | 0 2                  | 6             | į        | 70:00        | - E | 70.00        |
| Be        | <0.01              | Ö   | <0.02          | S   | <0.02  | Ę, | 402  | H        | 5             | . 0  | 600          |    | 7000         | 2 0                  | 707           | = 6      | 20.02        | Q.  | <b>40.02</b> |
| ž         | 2000               | S   | 200            | 2   | 8  | -  | 9 6  | 9        | 700           | - é  | 20.02        | 1  | 70'05        | ă                    | <b>40.002</b> | Ħ        | <b>40.02</b> | ×   | <0.02        |
| i         | 200                | 3 6 | 70.00          | 5 .   | 20.02  | 3  | 70:05  | WIO      | <0.02         | Σ,   | <0.02        | SH | <0.02        | S                    | <0.02         | Sn       | ₹0.02        | Z   | 40.02        |
|           | 70.05              | 3   | 70'02          | Au  | <0.02  | £  | T  | ž        | 40.02         | ×    | \$<br>\$     | S  | <0.02        | Ę                    | <b>CD 02</b>  | Ę        | 29           | 2   | 8            |

Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 061522

<sup>\*</sup> 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.

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

All Standards should be stored with caps tight and under appropriate laboratory conditions. Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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## Certified Reference Material CRM

03/12/23

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

CERTIFIED WEIGHT REPORT: 1. Iron (Fe) Compound Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: m/z-> m/z-> 5.0E7-5.0E7-1.0E8 1.0E8-2.0E4 NIST Test Number: 1.0E4 **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 [ 30.763 sec]:58126.D# [Count] [Linear] 110 5 IN346 2224912-500 58126 092122 Iron (Fe) 10000 **6UTB** 092125 Ambient (20 °C) Number Εţ 120 20 Conc. (µg/mL) 5000.1 10000 Nominal 130 30 99.995 5E-05 Balance Uncertainty Purity Uncertainty Assay 0.12 Flask Uncertainty 8 Purity (%) 0.10 140 6 Solvent: 20510011 100.0 8 7.0% 50.0034 Weight (g) 350.0 Lot # 150 50 Target (III) Nitric Acid Weight (g) Conc. (µg/mL) Nitric Acid 50.0111 Actual 160 60 10001.5 Actual 170 70 +/- (µg/mL) Expanded Reviewed By: Formulated By: Uncertainty 20.0 Giovannie 7439-89-6 0.8 180 CAS# (Solvent Safety Info. On Attached pg.) Giovanni Esposito Pedro L. Rentas Japane 1 OSHA PEL (TWA) SDS Information 190 90 5 mg/m3 200 100 orl-rat 7500mg/kg 3126a 092122 092122

SRM TSIN

m/z->

210

220

230

240

250

260

## Certified Reference Material CRM





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

|         |              |    |              |    |       |    | Trace Me     | stals | Verificat    | ion b | y ICP-MS               | gu) | /mL)  |    |              |          |              |    |       |
|---------|--------------|----|--------------|----|-------|----|--------------|-------|--------------|-------|------------------------|-----|-------|----|--------------|----------|--------------|----|-------|
| STORY . | 000          |    |              |    | 200   |    | 404          |       |              |       | NAME OF TAXABLE PARTY. |     |       |    |              |          |              |    |       |
| æ       | 40.02        | 3  | 70.05        | ŝ  | 70'0> | Ē  | 70102        | 3     | Z0702        | ž     | <0.10                  | £   | Z070≥ | š  | 402          | e        | <b>40.02</b> | *  | 40.02 |
| S.      | <0.02        | రే | <b>4</b> 02  | 山  | <0.02 | He | <b>40.02</b> | 3     | <0.02        | ź     | <0.02                  | Re  | <0.02 | ૹ  | <b>40.02</b> | <u>6</u> | <0.02        | n  | <0.02 |
| As      | Ø.2          | ප  | <0.02        | 큡  | <0.02 | 멸  | <0.02        | Mg    | <0.01        | ő     | <0.02                  | 꿆   | <0.02 | Ag | <0.02        | F        | <0.02        | >  | <0.02 |
| Ba      | <b>40.02</b> | ඊ  | Ø.02         | 3  | <0.02 | ㅂ  | <b>40.02</b> | Ma    | <0.10        | 몺     | <0.02                  | 8   | <0.02 | Š  | 40.2         | Ē        | <0.02        | χ. | <0.02 |
| Be      | <b>₩</b>     | ŏ  | <b>40.05</b> | පී | <0.02 | £  | 40.2         | Hg    | 40.2         | Δ.    | <0.02                  | Ru  | <0.02 | Ŗ  | <0.02        | 뎚        | <0.02        | ٨  | <0.02 |
| Ä       | <b>40.02</b> | රි | Ø.10         | ප  | 40.10 | ጟ  | <b>40.02</b> | Mo    | <b>40.02</b> | £     | <0.02                  | Sm  | <0.02 | S  | <0.02        | Sn       | <0.02        | Zu | <0.05 |
| В       | <0.02        | ರ  | <0.10        | Απ | <0.02 | £  | <0.02        | R     | <0.02        | M     | <0.2                   | ß   | <0.02 | Ta | <0.02        | F        | <0.02        | Z  | <0.02 |

(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.

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.

2 of 2

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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

Description: Lot Number:

58119 120822 Potassium (K)

Solvent: 20510011 Nitric Acid

Lot #

Javanva

アイクラクスで

60.0 <u>a</u>

2%

Nominal Concentration (µg/mL):

NIST Test Number:

**6UTB** 10000 Ambient (20 °C) 120825

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

3000.4

5E-05 Belance Uncertainty

0.06 Flask Uncertainty

Nitric Acid

Formulated By:

Giovanni Esposito

120822

Reviewed By:

Pedro L. Rentas

120822

| 12 [1]  | Potassium nitrate (K)                                   | Compound  |
|---|---|---|
| [1] Spectrum No.1 [ 35.763 sec]:58119 D# (Count II Insert | IN034 KD022021A1 10000 99.989 0.10 37.6 79.7990 79.8075 | Lot Nominal Purity Uncertainty Assay Target Actual RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) C                |
| 35.763 se   | 10000   | Nominal Purity Uncertainty Assay Conc. (µg/ml.) (%) Purity (%) (%)  |
| 9C]:58  | 99.999  | Purity<br>(%)   |
| 119.0   | 0.10  | Uncertainty<br>Purity (%)   |
| #<br>[00]   | 37.6  | Assay<br>(%)  |
| inti II ina   | 79.7990   | Target<br>Weight (g)  |
|   | 79.8075   | Actual<br>Weight (g)  |
|   | 10001.1   | Actual<br>Conc. (µg/mL  |
|   | 10001.1 20.0 7757-79-1                                  | Expanded Uncertainty +/- (µg/mL)  |
|   | 7757-79-1   | (Solv   |
|   | 5 mg/m3   | Expanded SDS Information Actual Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 |
|   | orl-rat 3015 mg/kg 314                                  | tached pg.)   |
|   | kg 3141a  | NIST  |

| m/z-y                  | 5000   | m/z-> | 1.0E5 | m/z->    | 1.000 | 2.016 |
|------------------------|--|-------|-------|----------|-------|-------|
| salatinak en eganda aa | and distinct access gapen game to the street dige access |       |       | ,        |       |       |
| 210                    |  | 110   |       | ō        |       |       |
|                        |  | 0     |       |          |       |       |
| 220                    |  | ก     |       | N.       |       |       |
|                        |  |       |       |          |       |       |
| 230                    |  | 130   |       | <b>3</b> |       |       |
|                        |  | 1     |       |          |       |       |
| N<br>4                 |  | 4.    |       | 4        |       |       |
|                        |  |       |       |          |       |       |
| N.G.                   |  | 50    |       | Ø.       |       |       |
|                        |  |       |       | -        |       |       |
| N<br>0<br>0            |  | 160   |       | 0        |       |       |
|                        |  |       |       |          |       |       |
|                        |  | 170   |       | 8        |       |       |
|                        |  |       |       |          |       |       |
|                        |  | 180   |       | Ö        |       |       |
|                        |  |       |       |          |       |       |
|                        |  | 190   |       | 0        |       |       |
|                        |  | 6)    |       |          |       |       |
|                        |  | 200   |       | 100      |       | ,     |
|                        |  |       |       |          |       |       |

Lot # 120822

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

|                | Bi Be  |          |
|----------------|--|----------|
|                | 4000<br>4000<br>4000<br>4000<br>4000   |          |
|                | <b>585888</b> 8  |          |
| Œ              | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                                    |          |
|                | 등 유 명 전 함 표 것  |          |
|                | \$ |          |
|                | 3234483  | 1.       |
|                | 402<br>402<br>402<br>402<br>402  | Trace Me |
|                | NA BA BA L L   | etals    |
| (T) = Tar      | 40.00<br>40.00<br>40.00<br>40.00<br>40.00<br>40.00<br>40.00                  | Verifica |
| Target analyte | K P P Z O K N  | ation    |
| alyte          | 4022<br>4022<br>4022<br>4022<br>7  | by ICP-  |
|                | S B B B B B  | SW       |
|                | 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8  | (Jm/gu)  |
|                | Ja Sr Na S. S.   |          |
|                | 402<br>402<br>402<br>402<br>402<br>402<br>402<br>402<br>402<br>402           |          |
|                | 计划证证证证   |          |
|                | 4000<br>4000<br>4000<br>4000<br>4000   |          |
|                | 55~\$<□≤   |          |
|                | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 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.
- \* 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 # 120822

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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: 58024 060523 Chromium (Cr) 21110221 Lot # Nitric Acid Solvent: Lavense

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

Nominal Concentration (µg/mL): Recommended Storage: **Expiration Date:** 1000 Ambient (20 °C) 060526

Compound Volume shown below was diluted to (mL): NIST Test Number: Number Part **BTU9** Number Lot 2000.02 Factor Dilution Vol. (mL) Pipette (mL) Conc. (µg/mL) 0.058 5E-05 Initial Flask Uncertainty **Balance Uncertainty** Uncertainty Nominal Conc. (µg/mL) Conc. (µg/mL) Initial Final Reviewed By: +/- (µg/mL) Uncertainty Expanded CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) Pedro L. Rentas **SDS Information** 

P20

TSIN SRM

3112a

 Chromium(III) nitrate nonahydrate (Cr) 58124 071122 0.1000 200.0 0.084 1000 10000.1 1000.0 12 7789-02-8 0.5 mg(Cr)/m3 ort-rat 3250 mg/kg

| m/z->            | N<br>5<br>10 | 5.0E5        | 5.0E5 | m/z->       | 5000 | 1.004 |
|------------------|--------------|--------------|-------|-------------|------|-------|
|                  |              |              |       | 3           |      |       |
| N 10             |              | 110          |       | <b>o</b> .  |      |       |
| h                |              |              |       | 7           |      | (     |
| N<br>N<br>N<br>N |              | 120          |       | N.<br>O     |      | (     |
| 230              |              | 130          |       | ۵.<br>۵.    |      |       |
|                  |              |              |       |             |      | (     |
| 240              |              | 140          |       | ò           |      |       |
| N                |              | <u></u>      |       | (h          |      |       |
| 250              |              | 150          |       | 0           |      |       |
| 260              |              | 160          |       | 0           |      |       |
|                  |              |              |       |             |      |       |
|                  |              | 170          |       | 70          |      |       |
|                  |              | 380          |       | <b>8</b> 2. |      |       |
|                  |              | 0            |       |             |      |       |
|                  |              | 190          |       | 90          |      |       |
|                  |              | N<br>0-<br>0 |       | 100         |      |       |
|                  |              | Ŏ            |       | 0           |      |       |

Part # 58024



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

|              |   |               | _     |              |              |              | _          |   | _            | = |
|--------------|---|---------------|-------|--------------|--------------|--------------|------------|---|--------------|---|
|              | B                                       | ᄧ             | Ве    | В            | As           | Sb           | Δ          | Monthly   |              |   |
|              | A).02                                   | <b>4</b> 0.02 | 40,01 | <b>A</b> .02 | <b>40.2</b>  | △0.02        | △0.02      |   |              |   |
|              | δ                                       | පි            | Ω     | င္တ          | දි           | ర్జ          | Ω          |   |              |   |
|              | <b>40.02</b>                            | A).02         |       | 40.02        | - 40.02      | <b>∆0.2</b>  | 40.02      |   |              |   |
|              | Æ                                       | ဂ္ဂ           | වූ    | ନ୍ଥ          | 멸            | 녆            | Dy         | 8.0   |              |   |
|              | <b>40.02</b>                            | 40.02         | 40.02 | <0.02        | <0.02        | 40.02        | <0.02      | mineral affection   |              |   |
|              | 끃                                       | Ľ             | सु    | Ħ            | Ħ            | H            | Ж          | Short Street  |              |   |
|              | <b>40.02</b>                            | 40.02         | 40.2  | 0.02         | <0.02        | 40.02        | 40.02      |   | I race M     | 1 |
|              | 圣                                       | Мо            | ВH    | Ķ            | ₩            | Į.           | Е          | MINION SERVICE  | Metals       | 1 |
| 3            | A),02                                   | 40.02         | 40.2  | <b>40.02</b> | 40,01        | <b>∆</b> .02 | 40.02      | SI RECEIPTOR  | Verification |   |
| Toron analys | ~                                       | 7             | 70    | 2            | ဝွ           | ₹            | Z          | SHOWING THE   | Clon         |   |
|              | <b>∆</b> 0.2                            | 40.02         | 40.02 | 40,02        | 40.02        | 40.02        | <0.02      | THE REAL PROPERTY.  | by ICP-M     |   |
|              | Sc                                      | Sm            | Ru    | 뫊            | Rh           | æ            | P          |   |              | 5 |
|              | <0.02                                   | <0.02         | <0.02 | 40.02        | 40,02        | 40.02        | <0.02      |   | g/mL)        |   |
|              | Ta                                      | ç             | ş     | Z.           | Ag           | Si.          | %          |   |              |   |
|              | 40.02                                   | <0.02         | 40.02 | 402          | <b>40.02</b> | 40.02        | <b>402</b> |   |              |   |
| į            | ======================================= | Sn            | Ħ     | ₽            | ᄇ            | 귿            | Tb         |   |              |   |
|              | 40,02                                   | 40.02         | 40,02 | 40,02        | 40.02        | 40,02        | <0.02      | State of the last |              |   |
|              | Zr                                      | Zn            | ~     | 뀾            | ۷            | Ϥ            | W          |   |              |   |
|              | <0.02                                   | <0.02         | <0.02 | <0.02        | <0.02        | 40.02        | <0.02      |   |              |   |

(I)= larget 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.

\* 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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# Certified Reference Material CRM

M5697 B: 10/27/23

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

| CERTIFIED WEIGHT REPORT:              | l <del></del>                               |             |                                |          |                       |                                       | Lot #          | Solvent:          |   |                |            |  |                   | L:   |
|---------------------------------------|---|-------------|--------------------------------|----------|-----------------------|---------------------------------------|----------------|-------------------|---|----------------|------------|--|-------------------|------|
| - P                                   | Part Number:<br>Lot Number:<br>Description: | O look life | 58029<br>102523<br>Copper (Cu) | 9        |                       |                                       | 24002546       | Nitric Acid       |   |                |            |  |                   |      |
|                                       |   |             |                                |          |                       |                                       | 2,0%           | 40.0              | Nitric Acid                                 | Formulated By: | y:         | Benson Chan                            | 102523            | -    |
| Exp                                   | Expiration Date:                            |             | 102526                         | 2        |                       |                                       |                | (mL)              |   |                | 0          | D                                      |                   |      |
| Nominal Concentration (µg/mL):        | Concentration (µg/mL):                      | <u></u> >   | 1000                           | S        |                       |                                       |                |                   |   | M              | N          | tento                                  |                   |      |
| NIST                                  | NIST Test Number:                           | 0           | втв                            |          | 5E-05                 | Balance Uncertainty                   | inty           |                   |   | Reviewed By:   |            | Pedro L. Rentas                        | 102523            |      |
| Volume sh                             | Volume shown below was diluted to (mL):     | diluted     | 1 to (mL):                     | 2000.02  | 0.058                 | Flask Uncertainty                     |                |                   |   |                |            |  |                   | Ĺ    |
|                                       |   |             |                                |          |                       |                                       |                |                   |   | Expanded       |            | SDS Information                        | tion              |      |
| Compound                              | z   | Part        | Lot                            | Dilution | Initial<br>Vol. (ml.) | Uncertainty Piperta (ml.)             | Nominal        | Initial           | Final                                       | Uncertainty    | (Solv      | (Solvent Safety Info. On Attached pg.) | Attached pg.)     | NIST |
|                                       |   | 1400 HOCK   | reamber                        | 1 00000  | AOF (THE)             | voir (nint) riporte (nint) (          | Conc. (Agrant) | Conc. (July 1982) | Contra (ug/mic)                             | +/= (Jg/10L)   | 50#        | OSHA FEL (TWA)                         | E                 | MANC |
| 1. Copper(II) nitrate trihydrate (Cu) |   | 58129       | 100223                         | 0.1000   | 200.0                 | 0.084                                 | 1000           | 10000.1           | 1000.0                                      | N<br>N         | 10031-43-3 | 1 mg/m3                                | orl-rat 794 mg/kg | 3114 |
| 1.006                                 | [1] Spectrum No.1                           | Z<br>Z      | _                              | 3.422 s  | əc]:58(               | 33.422 sec]:58029.D# [Count] [Linear] | Sount] [Lir    | near]             | 2004  |                |            |  |                   |      |
| 5.0MS                                 |   |             |                                |          |                       |                                       |                |                   | hinkin dhasha dha 1970 u maille agtic a ca  |                |            |  |                   |      |
|                                       |   |             |                                |          |                       |                                       |                |                   | direktirak alak alak dikenak berak bandarak |                |            |  |                   |      |
| m/z->                                 | 10  |             | N .                            | <u>ය</u> | 32<br>12              | 40                                    | 50             | 60                | 70  |                | 80         | 90                                     | 100               |      |
|                                       |   |             |                                |          |                       |                                       |                |                   |   |                |            |  |                   |      |
| 2.5E7                                 |   |             |                                |          |                       |                                       |                |                   |   |                |            |  |                   |      |
| m/z-v                                 | 110   |             | 120                            | 130      |                       | 140                                   | 150            | 160               | 170   |                | 180        | 190                                    | 200               |      |
| 2.0€7                                 |   |             |                                |          |                       |                                       |                |                   |   |                |            |  |                   |      |
| 1.0€7                                 |   |             |                                |          |                       |                                       |                |                   |   |                |            |  |                   |      |
| m/z->                                 | N 10  |             | 200                            | 230      |                       | N 40                                  | 250            | 260               |   |                |            |  |                   |      |
|                                       |   |             |                                |          |                       |                                       |                |                   |   |                |            |  |                   |      |

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

|                      |       | _               |               |          |               | _             | _            | V - 127   | -            |
|----------------------|-------|-----------------|---------------|----------|---------------|---------------|--------------|-----------|--------------|
|                      | Ľ     | <u>в</u>        | Ве            | Ва       | As            | Sb            | Δ            |           |              |
|                      | 20.02 | 8.00            | 10.0          | 40.02    | 402           | 40.02         | 40.02        |           |              |
|                      | 2     | , ზ             | υ             | င္ပ      | ပ္ပ           | δ             | 8            |           |              |
|                      | -     | <b>&lt;0.02</b> | <b>40.02</b>  | <0.02    | <0.02         | 40.2          | <0.02        |           |              |
|                      | Au    | Š.              | Ç             | £        | 멸             | Zi,           | Dy           |           |              |
|                      | <0.02 | 40,02           | <0.02         | <0.02    | <0.02         | 40.02         | 40.02        |           |              |
|                      | 3     | F               | 팖             | =        | Ы             | Но            | Ħ            |           |              |
|                      | 40.02 | <b>40.02</b>    | 40.2          | △0.02    | <0.02         | <0.02         | 40.02        | 1         | Trace M      |
|                      | Nd    | Мо              | Hg            | M        | Mgg           | Lu            | <u>E</u>     |           | letals       |
| (T) = Target analyte | A).02 | 40.02           | 40.2          | <0.02    | 10.05         | 40.02         | 40.02        |           | Verifica     |
| et anal              | ×     | 7               | ק             | Ъ        | တ္တ           | 3             | Z            |           | <del>-</del> |
| vie                  | 40.2  | 40.02           | 40.02         | 40.02    | 40.02         | <0.02         | <0.02        | 29 10     | -4-10-14<br> |
|                      | &     | Sm              | Ru            | 짱        | Rh            | Re            | Pr           | Ę         |              |
|                      | 40.02 | <0.02           | 40.02         | A).02    | 40.02         | <b>6</b> 0.02 | 40.02        | g/ 1111L/ |              |
|                      | Ta    | Ø               | Sr            | Z        | Ag            | S:            | Š            | Marchine  |              |
|                      | 40,02 | <0.02           | 40.02         | 40.2     | 40.02         | <b>40.02</b>  | 40.2         |           |              |
|                      | 11    | Sn              | ď             | ₽        | ∄             | Te            | 급            |           |              |
|                      | 40.02 | 40.02           | 40.02         | 40.02    | 40.02         | <0.02         | 40.02        |           |              |
|                      | Zr    | 25              | ĸ             | <b>¥</b> | <             | ď             | W            |           |              |
|                      | <0.02 | <b>∆</b> 0,02   | <b>∆</b> 0.02 | <0.02    | <b>∆</b> 0.02 | <b>∆</b> 0.02 | <b>40.02</b> |           |              |

### 1.1

### Physical Characterization:

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

### Certifled 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.

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ırt # 58029

2 of 2

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# Certified Reference Material CRM

M5648 A: 10/23/23

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

CERTIFIED WEIGHT REPORT: 1. Manganese(II) nitrate tetrahydrate (Mn) Compound Nominal Concentration (µg/mL): m/z-> m/z-> M/Z-V 5.OE7 1.0≣8 5.0厘7 1,0E8 2.5E6 5.0E6 Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: [1] Spectrum No.1 Lot Number: Description: 110 210 0 58125 Number Part 58025 102623 **BTUB** 1000 Ambient (20 °C) 102626 Manganese (Mn) 071123 120 Number 20 Ĕ [ 34.243 sec]:57025.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 30 Vol. (mL) Pipette (mL) Conc. (µg/mL) 300.0 0.058 5E-05 Initial Flask Uncertainty Balance Uncertainty 240 140 Uncertainty 40 0.084 24002546 Nominal 2.0% Lot # 1000 250 150 00 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid Solvent: 10000.1 Initial <u>a</u> 60.0 260 160 00 Nitric Acid 1000.0 Final 170 0 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Expanded <u>2</u> 180 80 20694-39-7 CAS# (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) 90 Pedro L. Rentas Benson Chan SDS Information 5 mg/m3 200 100 ort-rat >300mg/kg P50 102623 102623 3132 SRM

Printed: 10/26/2023, 1:20:32 PM



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

|              | 4   | 3  | 1  | 3            | ,               | 3             | 2        | 7                  | 5        | 3             | Z      | 3                | Ş           | 3   | A        | 3                | ?   | 3            | <b>7</b> |
|--------------|-----|--|----|--------------|-----------------|---------------|----------|--------------------|----------|---------------|--------|------------------|-------------|---|----------|------------------|-----|--------------|----------|
| &<br>20.02   | Zn  | 40.02  | Sa | <b>∆</b> .02 | S               | <0.02         | Sm       | 40.02              | 7        | <b>6.02</b>   | Mo     | <b>6.02</b>      | L           | <0.02   | ද        | 40.02            | S   | <b>60.02</b> | Bi       |
| <0.02        | ×   | 40.02  | Tm | 40.02        | Sr              | <0.02         | 찙        | <0.02              | ۵,       | 40.2          | ЯН     | 40.2             | Fe          | 40.02   | ဂ္ဂ      | 40.02            | ರ   | 10.05        | Be       |
| A).02        | 4   | 40.02  | H  | <b>D</b> 2   | Z,              | <0.02         | RЬ       | <0.02              | Pd       | Н             | Mn     | <0.02            | . <b>F</b>  | 40.02   | ይ        | <0.02            | ဂ္ဂ | 40.02        | Ва       |
| A.02         | <   | 40.02  | Ħ  | 40.02        | Ag              | <0.02         | 쫎        | 40.02              | õ        | 40.01         | Mg     | A).02            | F.          | <b>40.02</b>  | 멸        | <0.02            | င္ပ | 0,2          | As       |
| A0,02        | u u | 40.02  | ie | 20.0≥        | Si              | A0.02         | <b>₹</b> | 40.02              | 3        | 40.02         | Ē      | A).02            | Н           | <b>40.02</b>  | ဌ        | <0.2             | ប្ច | △0.02        | æ        |
| <b>40.02</b> | W   | <0.02  | 41 | 40.2         | 8               | <0.02         | 7        | <0.02              | Z        | 40.02         | E      | <0.02            | Hf          | <0.02   | Ų        | <0.02            | ξ   | 40.02        | ≥        |
|              |     | THE RESERVE AND ADDRESS OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUMN TWO IS NAMED IN COLUMN TWO IS NAMED IN THE PERSON NAMED IN COLUMN TWI |    |              | SECTION SECTION | Water Company |          | Remote many series | SEMMENTS | SECTION PARTY | MINNER | STATES OF STATES | 0100 mm 550 | STATISTICS OF THE PARTY OF THE | SANTON S | a solution and a |     |              |          |
|              |     |  |    |              |                 | J/mL)         | in Chi   | by ICP-N           | נוסח     | Verifica      | letals | I race N         |             |   |          |                  |     |              | Γ        |
|              |     |  |    |              |                 |               |          | 950                |          |               |        |                  |             |   |          |                  |     |              |          |
|              |     |  |    |              |                 |               |          |                    |          |               |        |                  |             |   |          |                  |     |              |          |

### 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 balances that are calibrated with weights traceable to NIST (see above).
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CERTIFIED WEIGHT REPORT



Certified Reference Material CRM

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R:8/25) Lot # Solvent:

21110221

Nitric Acid

Part Number: Description: Lot Number: 58029 071723 Copper (Cu)

Recommended Storage: **Expiration Date:** Ambient (20 °C) 071726 2.0%

(mL)

40.0

Nitric Acid

Formulated By:

Benson Chan

071723

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): **NIST Test Number:** 1000 **BTU9** 2000.02 0.058 5E-05 Flask Uncertainty Balance Uncertainty Reviewed By: Pedro L. Rentas

Part

Lot

Dilution

Initia

Uncertainty

Nominal

Initial

 Copper(II) nitrate trihydrate (Cu) 58129 022723 0.1000 200.0 0.084 1000 10000.5 1000.0 2.2 10031-43-3 1 mg/m3 ori-rat 794 mg/kg

Number Number Factor Val. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LDSO 3114 SRM

Final Uncertainty Expanded (Solvent Safety Info. On Attached pg.) SDS Information TSIN

071723

5.0E5 1.0E6 [1] Spectrum No.1 [ 33.422 sec]:58029.D# [Count] [Linear]

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

|                      | [           | , <u>p</u>              | . E   | <u> </u>       | Ą            | 35         | A     |  | Ī        |   |
|----------------------|-------------|-------------------------|-------|----------------|--------------|------------|-------|--|----------|---|
|                      | F           |                         |       | Ì              |              | _          |       | Statement of the last  |          |   |
|                      | 20.02       | 200                     | 8 2   | 0.02           | 40.2         | 40.02      | 0.02  |  |          |   |
|                      | 2           | . გ                     | . τ   | ္ဇင္က          | င္ပ          | ర్జ        | Ω     |  |          |   |
|                      | -           | , <u>6</u> , <u>9</u> 2 | 0.02  | 0.02           | <b>60.02</b> | <b>6</b> 2 | 40.02 | Common of the last |          |   |
|                      | A           | . Ge                    | ဂ္ဂ   | S              | 달            | 탁          | Dy    | The same   |          |   |
|                      | 40.02       | A0.02                   | A) 02 | 40,02          | 40.02        | 40.02      | <0.02 |  |          |   |
|                      | 198         | : <u>F</u>              | क्र   | F7'            | 5            | Ήο         | Ж     | DESTRUCTION OF THE PERSON NAMED IN   |          |   |
|                      | 40.02       | 40.02                   | 40,2  | 40.02          | 40.02        | 40.02      | <0.02 | ALTERNATION OF THE PERSON NAMED IN   | Irace M  | 1 |
|                      | Z           | Mo                      | ВН    | Ma             | Mg           | ٤          | Ľ.    | Nestera  | etais    |   |
| (T) = Tarnot analyto | 40,02       | 40.02                   | 82    | <0.02          | 40.01        | <0.02      | <0.02 | MINISTERNATION OF THE PERSON NAMED IN  | Verifica |   |
| de anak              | ×           | 29                      | ש     | 25             | ွှ           | ¥          | Z     |  | tion     |   |
| To a                 | <b>∆0.2</b> | 40.02                   | 40.02 | 40.02          | 40.02        | <0.02      | 40.02 |  | by ICP-N |   |
|                      | Sc          | Sm                      | Ŗ.    | Rb             | Rh           | Re         | 꾸     |  | S (Hi    | , |
|                      | 40.02       | 40.02                   | <0.02 | <b>∆</b> 0.02  | 40.02        | 40,02      | <0.02 |  | g/mL)    |   |
|                      | Ta          | Ø                       | Sr    | Z              | Ag           | S:         | %     |  |          |   |
|                      | 40,02       | 40,02                   | 40.02 | <b>∆</b> 0.2   | 40.02        | <0.02      | <0.2  |  |          |   |
|                      | 11          | Sn                      | Im    | Ħ              | ∄            | 7          | 4.    |  |          |   |
|                      | 40.02       | 40,02                   | 40,02 | 40.02          | <0.02        | 40.02      | <0.02 |  |          |   |
|                      | Zr          | Z                       | Υ     | ۲ <del>۵</del> | <            | <b>4</b>   | W     | STATISTICS.  |          |   |
|                      | <0.02       | 40.02                   | <0.02 | <0.02          | 40.02        | <0.02      | <0.02 |  |          |   |

(I) = larget analyte

### Physical Characterization:

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

Certified by:

2 of 2

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

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# M5768 [M576] (B) R:1/3/24 Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: Magnesium nitrate hexahydrate (Mg) IN030 марозгозат Compound Nominal Concentration (µg/mL): m/z-> ~-z/m m/z-> Weight shown below was diluted to (mL): Recommended Storage: 2.0≡4 1.0E4 5.0E5 1.0E6 1000 2000 NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 쭕 **BTUB** 58112 091823 10000 Ambient (20°C) (M5+18), (M5+16) 091826 Magnesium (Mg) Number 120 ğ 20 [ 19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.02 0.058 Flask Uncertainty 10000 Nominal 130 230 30 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) (%) 140 0.10 240 40 Solvent: 24002546 Nitric Acid 150 234.9118 Weight (g) Target Lot # Ē Weight (g) Conc. (µg/mL) 234.9126 Nitric Acid Actual 160 260 0 10000.0 Actual 170 6 +/- (µg/mL) Expanded Uncertainty Reviewed By: Formulated By: 20.0 180 80 13446-18-9 (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 Pedro L. Rentas Lawrence Barry 190 **SDS Information** Ö Z 200 100 orl-rat 5440 mg/kg 3131a 091823 091823 SRM



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

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

|   | 555           | В     | Ве    | Ва    | As             | Sb    | A     |           |     |
|---|---------------|-------|-------|-------|----------------|-------|-------|-----------|-----|
|   |               |       |       |       |                | _     |       |           |     |
|   | ∆0.02         | 0.02  | 40.01 | <0.02 | <b>∆0.2</b>    | <0.02 | <0.02 |           |     |
|   | ₽<br>C        | ဝ     | Ω     | Ŝ     | ද              | ದ್    | Ω     |           |     |
|   | <b>∆</b> 0.02 | <0.02 | <0.02 | <0.02 | 40.02          | 40.2  | <0.02 |           |     |
|   | Αu            | င္စာ  | က္အ   | 8     | 탇              | 耳     | Dy    |           |     |
|   | <b>₹0,02</b>  | <0.02 | <0.02 | <0.02 | <0.02          | <0.02 | <0.02 |           |     |
|   | 73            | Ľ.    | Fe    | F     | ħ              | Ho    | Hf    |           | ı   |
|   | <0.02         | 40,02 | 40.2  | <0.02 | <0.02          | <0.02 | <0.02 | I acc     | -1  |
|   | Z.            | Mo    | Hg    | Mn    | Mg             | ŗ     | 5     | Mergis    | 2   |
| ) | <0.02         | <0.02 | <0.2  | <0.02 | <b>⊷</b> ]     | <0.02 | <0.02 | Verifica  | No. |
|   | ×             | 7.    | Р     | Pd    | S <sub>O</sub> | Ş     | Z     |           |     |
|   | 40.2          | 40.02 | 40.02 | <0.02 | <0.02          | 40.02 | <0.02 | יטע וכד-ו | 3   |
|   | Sc            | Sm    | Ru    | Rb    | Rh             | Re    | Pr    | AU (F     |     |
|   | <0.02         | <0.02 | <0.02 | 40.02 | 40.02          | <0.02 | <0.02 | g/mL)     |     |
|   | Ta            | CO.   | Sr    | Na    | δķ             | Σ:    | Se    |           | ١   |
|   | <0.02         | <0.02 | <0.02 | <0.2  | <0.02          | <0.02 | 40.2  |           |     |
|   | Ti            | Sn    | Im    | Th    | ∄              | Te    | -Tι-  |           |     |
|   | <0.02         | 0.02  | 0.02  | 40.02 | 40.02          | 40.02 | <0.02 |           |     |
|   | Zr            | Z     | ĸ     | 4,4   | ٧              | u     | ¥     |           |     |
|   | <0.02         | 40.02 | 40.02 | 40.02 | A).02          | <0.02 | 40.02 |           |     |

(1) = larget analyte

## Physical Characterization:

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

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## M5768 [M576] (B) R:1/3/24 Certified Reference Material CRM



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CERTIFIED WEIGHT REPORT: Magnesium nitrate hexahydrate (Mg) IN030 марозгозат Compound Nominal Concentration (µg/mL): m/z-> M/2-> m/z-> Weight shown below was diluted to (mL): Recommended Storage: 2.0≡4 1.OE4 5.0E5 1.0E6 1000 2000 NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 쭕 **BTUB** 58112 091823 10000 Ambient (20°C) (M5+18), (M5+16) 091826 Magnesium (Mg) Number 120 ğ 20 [ 19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.02 0.058 Flask Uncertainty 10000 Nominal 130 230 30 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) (%) 140 0.10 240 40 Solvent: 24002546 Nitric Acid 8.51 150 234.9118 Weight (g) Target Lot # Ē Weight (g) Conc. (µg/mL) 234.9126 Nitric Acid Actual 160 260 0 10000.0 Actual 170 6 +/- (µg/mL) Expanded Uncertainty Reviewed By: Formulated By: 20.0 180 80 13446-18-9 (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 Pedro L. Rentas Lawrence Barry 190 **SDS Information** Ö Z 200 100 orl-rat 5440 mg/kg 3131a 091823 091823 SRM



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

|   | 555           | В     | Ве    | Ва    | As             | Sb    | A     |           |     |
|---|---------------|-------|-------|-------|----------------|-------|-------|-----------|-----|
|   |               |       |       |       |                | _     |       |           |     |
|   | ∆0.02         | 0.02  | 40.01 | <0.02 | <b>∆0.2</b>    | <0.02 | <0.02 |           |     |
|   | ₽<br>C        | ဝ     | Ω     | Ŝ     | ද              | ದ್    | Ω     |           |     |
|   | <b>∆</b> 0.02 | <0.02 | <0.02 | <0.02 | 40.02          | 40.2  | <0.02 |           |     |
|   | Αu            | င္စာ  | က္အ   | 8     | 탇              | 耳     | Dy    |           |     |
|   | <b>₹0,02</b>  | <0.02 | <0.02 | <0.02 | <0.02          | <0.02 | <0.02 |           |     |
|   | 73            | Ľ.    | Fe    | F     | ħ              | Ho    | Hf    |           | ı   |
|   | <0.02         | 40,02 | 40.2  | <0.02 | <0.02          | <0.02 | <0.02 | I acc     | -1  |
|   | Z.            | Mo    | Hg    | Mn    | Mg             | ŗ     | 5     | Mergis    | 2   |
| ) | <0.02         | <0.02 | <0.2  | <0.02 | <b>⊷</b> ]     | <0.02 | <0.02 | Verifica  | No. |
|   | ×             | 7.    | Р     | Pd    | S <sub>O</sub> | Ş     | Z.    |           |     |
|   | 40.2          | 40.02 | 40.02 | <0.02 | <0.02          | 40.02 | <0.02 | יטע וכד-ו | 3   |
|   | Sc            | Sm    | Ru    | Rb    | Rh             | Re    | Pr    | AU (F     |     |
|   | <0.02         | <0.02 | <0.02 | 40.02 | 40.02          | <0.02 | <0.02 | g/mL)     |     |
|   | Ta            | CO.   | Sr    | Na    | δķ             | Σ:    | Se    |           | ١   |
|   | <0.02         | <0.02 | <0.02 | <0.2  | <0.02          | <0.02 | 40.2  |           |     |
|   | Ti            | Sn    | Im    | Th    | ∄              | Te    | -Tι-  |           |     |
|   | <0.02         | 0.02  | 0.02  | 40.02 | 40.02          | 40.02 | <0.02 |           |     |
|   | Zr            | Z     | ĸ     | 4,4   | ٧              | u     | ¥     |           |     |
|   | <0.02         | 40.02 | 40.02 | 40.02 | A).02          | <0.02 | 40.02 |           |     |

(1) = larget analyte

## 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).

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CERTIFIED WEIGHT REPORT: Part Number: 57004 102523 02/09/24 Lot # Solvent:

24002546 Nitric Acid

2.0% 

Nominal Concentration (µg/mL):

NIST Test Number:

BTU<sub>9</sub> 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

**Expiration Date:** 

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

Pipette (mL) Conc. (µg/mL) Nominal Conc. (µg/mL) Conc. (µg/mL) Final +/- (µg/mL) Uncertainty Expanded CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SDS Information LD50 NIST SRM





800-368-1131



## Certified Reference Material CRM

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

|    |               |    |                |                     |              |             | Trace M      | etals       | Verificat      | cation        | by ICP-M      | (J) S      | ua/mL)       |    |       |    |       |   |              |
|----|---------------|----|----------------|---------------------|--------------|-------------|--------------|-------------|----------------|---------------|---------------|------------|--------------|----|-------|----|-------|---|--------------|
|    | TATES AND AND |    | District Color | STATE OF THE PARTY. |              | Section and |              | SOMETHINGS. | NAME OF STREET | SAMOOGE STATE | SECOND SPINSO | None and a | . 18         |    |       |    |       |   |              |
| F  | <0.02         | 3  | <0.02          | Ďλ                  | <0.02        | HL          | <0.02        | Li          | <0.02          | z             | <0.02         | Ā          | <0.02        | Se | <0.2  | T. | <0.02 | M | <0.02        |
| Sp | <0.02         | ථ  | <b>40.2</b>    | 占                   | ₹0.02        | He          | <0.02        | 3           | <0.02          | £             | <0.02         | Re         | <0.02        | Š  | <0.02 | ę  | ₹0.02 | Þ | <0.02        |
| As | <0.7          | ඊ  | <0.02          | 립                   | ₹0.02        | ដ           | <b>€0.02</b> | Mg          | 10.0>          | ő             | <0.02         | Rh         | <0.02        | Ag | <0.02 | F  | <0.02 | > | <b>40.02</b> |
| Ba | <0.02         | ర  | <0.02          | 3                   | <0.02        | ㅂ           | <0.02        | Mn          | <0.02          | 2             | <0.02         | 8          | <0.02        | ž  | 40.2  | Ħ  | <0.02 | 2 | <0.02        |
| æ  | Т             | Ç  | <b>40.02</b>   | ő                   | <b>40.02</b> | £           | <0.7         | Hg          | <02            | Δ,            | <0.02         | Ru         | <0.02        | š  | <0.02 | Tm | ₹0.02 | × | <b>40.02</b> |
| 洒  | <0.02         | රි | <0.02          | ප                   | <0.02        | ឌ           | <b>40.02</b> | Mo          | <0.02          | 武             | 40.02         | Sm         | <0.02        | S  | <0.02 | S  | <0.02 | 2 | <0.02        |
| æ  | <0.02         | ರೆ | <0.02          | Au                  | <0.02        | £           | ₹0.02        | PK          | <0.02          | M             | <0.2          | S          | <b>40.02</b> | Ta | <0.02 | F  | <0.02 | Z | <b>40.02</b> |

(T) = Target analyte

### Physical Characterization:

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

### Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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

<sup>\*</sup> 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.

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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## CERTIFIED WEIGHT REPORT:

Part Number: Description: Lot Number: 57050 071123 Tin (Sn)

Salvents: 21110221

Nitric Acid Hydrochloric acid

Lot #

22D0562008

Nominal Concentration (µg/mL): Recommended Storage: **NIST Test Number:** Expiration Date: 1000 Ambient (20 °C) 071126

Weight shown below was diluted to (mL): **BTU9** 499.93

RM#

Number

Conc. (µg/mL) Nominal

(%)

Uncertainty Assay
Purity (%) (%)

Weight (g)

Target

ρţ

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> 10.0 30.0

3 6%

Nitric Acid

Formulated By:

Benson Chan

071123

Hydrochloric acid

Reviewed By:

Pedro L. Rentas

071123

| Weight (g)               | ACTUAL             |             |
|--------------------------|--------------------|-------------|
| Conc. (µg/ml.)           | Actual Ur          |             |
| '- (µg/mL)               | certainty          | xpanded     |
| CAS# OSHA PEL (TWA) LD50 | (Solvent Safety    | SUS         |
| PEL (TWA)                | y Info. On Attache | Information |
| LD50                     | d pg.)             |             |
| SRM                      | TSIN               |             |

1. Ammonium hexafluorostannate(IV) (Sn) m/z-> ---x/m --Z/111 2.5E4 5.0E4 1.0ES 2.0E6 2.5E5 S.OEG [1] Spectrum No.1 210 110 0 IN010 SND042023A1 120 220 N [ 15.034 sec]:58150.D# [Count] [Linear] 1000 230 130 8 240 140 0.10 40 44.2 250 150 Ö 1.13107 1.13286 160 260 60 1001.6 170 70 2.0 180 80 16919-24-7 190 90 7 mg/m3 200 100 ₹ 3161a

Part # 57050

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

|                   | Al Shaper   |           |
|-------------------|---|-----------|
|                   | 4000<br>4000<br>4000<br>4000<br>4000<br>4000<br>4000<br>400 |           |
|                   |   |           |
|                   | 58555   | ı         |
|                   | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$    |           |
|                   | A C C C E E P   |           |
|                   | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4                       |           |
|                   | HH<br>Ho<br>Hr<br>Fe  |           |
|                   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   | Irace N   |
|                   | Mo Ma Li  | 1etal:    |
| e1 = U            | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   | s Verific |
| T) = Tamet anak/a | × 7 × 8 8 8 × 1   | ation     |
|                   | 44444   | by CP-    |
|                   | S R R R R P   | ns (      |
|                   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   | Ja/mL)    |
|                   | Z S Z Z S   |           |
|                   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02          |           |
|                   | T T T T T   |           |
|                   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   |           |
|                   | * * * * * * * * * * * * * * * * * * *                       |           |
|                   | 000<br>000<br>000<br>000<br>000<br>000                      |           |

(I) = larget 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.

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Certified Reference Material CRM

R: 02109124





ANAB ISO 17034 Accredited AR-1539 Certificate Number https:///Absolutestandards.com 091923 091923 (Solvent Safety Info On Attach SDS Information Pedro L. Rentas Lawrence Barry Formulated By: Reviewed By: Expanded Nitric Acid Final Nitric Acid 40.0 (III) hital 24002546 2.0% Nominal Balance Uncertainty Flask Uncertainty 5E-05 0.058 Initial 2000.02 Dilution Ambient (20 °C) Cobalt (Co) Volume shown below was diluted to (mL): 57027 091923 091926 ĕ 1000 **6UTB** Part Description: **Expiration Date:** Recommended Storage: Nominal Concentration (ug/mL): NIST Test Number: Part Number: Lot Number: CERTIFIED WEIGHT REPORT:

|   |        |        |            |           |                | TANK BURNE   | 10000         | CHICAGO CONTROL CONTRO | URCH LABILLY | ianioc)    | (Solvent Safety Into, On Attached pg.)  | ttached pg.)                                     | 202  |
|---|--------|--------|------------|-----------|----------------|--|---------------|--|--------------|------------|---|--|------|
| Compound  | Number | Number | Factor     | Vol. (mL) | Pipette (mL) C | conc. (ug/ml.)   | Conc. (µg/mL) | Conc. (ug/ml.)   | +/- (ng/mL)  | CAS#       | Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) | 1050   | SRM  |
|   |        |        |            |           |                |  |               |  |              |            |   |  |      |
| Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0 | 58127  | 050923 | 0.1000     |           | 0.084          | 1000   | 10000         | 100001 100001  | 9.0          | 10008.000  | 000   | 700  |      |
|   |        |        |            |           |                |  | 20000         |  | 7:5          | 100c0-22-9 | O.UZ ING/ITIS   | STEE 10020-22-9 0.02 mg/ms on-rat 691 mg/kg 3113 | 3113 |
|   |        |        |            |           |                |  |               |  |              |            |   |  |      |
| 2000  | 之 ヒコギ  | 1.0    | 9 4 DAG 45 | Cau. Co   | CHARLE WO      | [1] Spectrum No.1 F at year, near, n |               |  |              |            |   |  |      |

| 1.0E6                                   | 5.0E5 | m/z->      | 5.0E7 | 1.0E8 | 5.0E7 |
|---|-------|------------|-------|-------|-------|
|   |       |            |       | F     |       |
|   |       | .0         |       | 0     |       |
|   |       | 0          |       | 120   |       |
| L 34-243 Secj.baok7.D# [Count] [Linear] |       | Ō          |       | 130   |       |
|   |       | .0         |       | 140   |       |
|   |       | .09        |       | 150   |       |
|   |       | . <b>O</b> |       | 160   |       |
|   |       |            |       | 170   |       |
|   |       | 02         |       |       |       |
|   |       | 80         |       | 160   |       |
|   |       | 00         |       | 180   |       |
|   |       | 100        |       | 200   |       |

Lot # 091923

250

240

230

220

010

W/Z->

## Certified Reference Material CRM





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

|    |              |    |               |     |                |    | Trace M  | etals            | Verifical   | tion   | by ICP-M      | 4S (F   | ig/mL)          |                        |                     |                |       |                     |                 |
|----|--------------|----|---------------|-----|----------------|----|--|------------------|---|--------|---------------|---------|-----------------|------------------------|---------------------|----------------|-------|---------------------|-----------------|
| 1  |              |    |               |     |                |    | STREET, STREET | No section lives | ALL DESCRIPTION OF THE PERSON | 10.000 | Market Mark   | MINNSH. | San Salar Salar | NAME OF TAXABLE PARTY. | Service of the last | SECOND STATES  |       | THE PERSON NAMED IN | STREET, SQUARE, |
| IV | <0.02        | ಶ  | 1             | Š   | 40.02 Dy 40.02 | Ħ  | <0.02  | П                | <0.02   | Z      | <0.02         | Æ       | <0.02           | B                      | <0.2                | £              | <0.02 | A                   | <0.02           |
| ౙ  | <b>40.02</b> | రే | <b>40</b> 7   | 占   | <0.02          | H9 | <0.02  | .3               | ₹005  | Ź      | ₹0.02         | 2       | <0.02           | Š                      | 40.02               | T <sub>e</sub> | 40.05 | ם                   | 40.02           |
| As | <b>Q</b> 5   | ප  | 40.02         | 呂   | <b>40.02</b>   | ų  | <0.02  | Mg               | 10.05   | ඊ      | ₹0.02         | 됩       | <0.02           | Ag                     | <b>40.02</b>        | F              | <0.02 | >                   | Ø.02            |
| 쯃  | <b>40.02</b> | చ  | <b>40.02</b>  | 3   | <b>4002</b>    | ㅂ  | <0.02  | Ma               | <0.02   | 콘      | ₹000          | 2       | <b>40.02</b>    | N <sub>a</sub>         | 40.2                | Ę              | 20:0> | Ŗ                   | Ø.02            |
| 2  | ¥0.01        | ඊ  | <b>20.0</b> 2 | త్ర | <b>40.02</b>   | હ  | 40.2   | 쁀                | \$ 20   | م      | ₹0.02         | 콥       | 40.02           | Şt                     | <b>40.02</b>        | Tm             | Ø.02  | 7                   | Ø.02            |
| 遥  | <b>40.02</b> | රි | ۳             | Ğ,  | <b>4002</b>    | ដ  | <0.02  | Mo               | <b>40.02</b>  | Æ      | <b>20'0</b> > | S       | <0.02           | S                      | <b>40.02</b>        | Sn             | 40.02 | Zn                  | Ø.02            |
| æ  | <0.02        | ට් | <0.02         | Αn  | <0.02          | 윤  | Z0'0>  | P                | <0.02   | м      | 40.2          | S       | ₹0.02           | Fee Fee                | <b>40,02</b>        | Ħ              | Ø.02  | 72                  | Ø.02            |

(T)= Target analyte

### Physical Characterization:

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



<sup>\*</sup> 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.



Lot # 091923

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<sup>\*</sup> 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. 800-368-1131

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## Certified Reference Material CRM

M5801



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

CERTIFIED WEIGHT REPORT: 1. Arsenic (As) Compound Nominal Concentration (µg/mL): M/2-> m/z-> -z/m 5.OE4 2.5E4 Recommended Storage: 1.0E5 2.0ES 1000 Volume shown below was diluted to (mL): 500 **NIST Test Number: Expiration Date:** Part Number: Description: Lot Number: [1] Spectrum No.1 210 110 0 58133 Number Part **SUTB** 1000 111326 57033 111323 Ambient (20 °C) Arsenic (As) 020522 Number 120 D D ONN NO [ 34.433 sec]:57033.D# [Count] [Linear] 0.1000 4000.0 Dilution Factor 230 130 30 Vol. (mL) 5E-05 400.0 initial 0.06 Pipette (mL) Conc. (µg/mL) Flask Uncertainty Balance Uncertainty Uncertainty 240 140 40 0.084 24002546 Nominal 2.0% Lot # 100 250 160 50 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid 10001.0 Solvent: Initial 80.0 260 160 60 Nitric Acid 1000.0 Fina 170 0 Formulated By: Reviewed By: +/- (µg/ml.) Uncertainty Expanded 2.0 180 Thomas 80 7440-38-2 (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) Pedro L. Rentas Lawrence Barry 90 SDS Information 0.5 mg/m3 100 000 orl-rat 500 mg/kg LD50 111323 111323 3103a NIST SRM

Printed: 2/8/2024, 5:01:04 PM

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

|                | - H H H > /0 >  | 8           | - |
|----------------|---|-------------|---|
|                | AS Sb Ba Bi Bi  |             |   |
|                | 4002<br>4002<br>4002<br>4002<br>4002                              |             |   |
|                | 5 8 ជ ង 8 ជ ប   |             |   |
|                | 402<br>402<br>402<br>402<br>402<br>402                            |             |   |
|                | <b>₹</b> ७८८ = = ⊅  |             |   |
|                | 6000<br>6000<br>6000<br>6000                                      |             |   |
|                | 322428  |             |   |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                         | Trace N     |   |
|                | N H M L L   | letals      |   |
| 9              | 40.2<br>40.2<br>40.2<br>40.2<br>40.2                              | Verifica    |   |
| = Target       | M R P B O R R   | E<br>S<br>S |   |
| Target analyte | 40.02<br>40.02<br>40.02<br>40.02                                  | by ICP-N    |   |
|                | S R R R R R   | id) St      |   |
| R              | 4444<br>444<br>444<br>444<br>444<br>444<br>444<br>444<br>444<br>4 | g/mL)       |   |
|                | Ta Sr Na Se   |             |   |
|                | 40.2<br>40.2<br>40.2<br>40.2<br>40.2<br>40.2                      |             |   |
|                | ######################################                            |             |   |
| (e)            | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02                |             |   |
|                | Z Z Y Z < C &   |             |   |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                         |             |   |

### 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
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  \* 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

## Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

R102109124

MURIC

Solvent: 21110221

Nitric Acid

Lot #

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

CERTIFIED WEIGHT REPORT:

Part Number: **Lot Number:** 

57115 041723

Description:

Phosphorous (P)

**Expiration Date:** 

041726

Nominal Concentration (µg/mL): Recommended Storage: NIST Test Number: 10000 Ambient (20 °C)

**BTUB** 

5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 2000.02

Number 5 Conc. (µg/mL) Nominal 0.058 Flask Uncertainty Purity 3 Uncertainty Assay Purity (%) E Target

1. Ammonium dihydrogen phosphate (P)

IN008 PV082019A1

10000

99,999

0.10

27.5

RM#

Compound

22%

40.0

Nitric Acid

Formulated By:

Lawrence Barry

041723

into

Reviewed By:

Pedro L. Rentas

Expanded SDS Information 041723

Weight (g) 72.7287 Weight (g) Conc. (ug/mL) 72.7289 Actual 10000.0 Actual +/- (µg/mL) Uncertainty 20.0 7722-76-1 CAS# (Solvent Safety Info. On Attached pg.)

# OSHA PEL (TWA) LD50 5 mg/m3 orl-rat >2000mg/kg 3186 NIST SRM

Part # 57115

1 of 2

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

|                 | Γ              |              |                |               |               |              | , .          |                                   | Г        |     |
|-----------------|----------------|--------------|----------------|---------------|---------------|--------------|--------------|-----------------------------------|----------|-----|
|                 | F              |              | i Re           | , 5           | , As          | 9            | # ≥          |                                   |          |     |
|                 | 20.02          | 20.02        | 10.0           | 20.02         | 202           | 20.02        | 40.02        | A STATE OF THE PERSON NAMED IN    |          |     |
|                 | 2              | , S          | ť              | ů             | £             | . E          | S            |                                   |          |     |
|                 | A),02          | A0.02        | A)02           | 40.02         | <b>6</b> 002  | 40.2         | <b>40.02</b> | MANAGEMENT OF THE PERSON NAMED IN |          |     |
|                 | æ              | ှင့          | ୍ଷଳ            | 8             | 먑             | É            | Dy           | Section 2                         |          |     |
|                 | A0.02          | A.02         | 40.02          | <b>∆</b> 0,02 | 40.02         | 40.02        | <b>40.02</b> | William Constitution              |          |     |
|                 | 3              | 5            | 놂              | r r           | ıl            | H            | Hf           | 1                                 | 1        |     |
|                 | <b>∆</b> 0,02  | 40,02        | <b>6</b> 22    | 40.02         | 40.02         | 40.02        | <b>40.02</b> |                                   | Trace Me |     |
|                 | Æ              | Mo           | Hg             | Mn            | Mg            | Ţ            | Е            |                                   | letals   | I   |
| Townst analytic | <b>40.02</b>   | A),02        | 402            | 40.02         | 0.01          | <b>40.02</b> | <0.02        |                                   | Verifica |     |
|                 | ~              | ጀ            | ۳              | 2             | Ŝ             | ₹            | Z            |                                   | tion     |     |
|                 | <b>A</b>       | 40,02        | 7              | 40.02         | 40.02         | 40.02        | 40,02        |                                   | by ICP-I |     |
|                 | Sc             | Sm           | R <sub>L</sub> | 25            | R.            | æ            | 27           | Į.                                | E SI     |     |
|                 | 40.02          | 40.02        | 40.02          | 40.02         | 40.02         | A<br>02      | 40.02        | ľ                                 | g/mL)    | 100 |
|                 | T <sub>B</sub> | S            | Ş              | Z             | ¥             | S            | &            |                                   |          |     |
|                 | 40.02          | <b>∆</b> .02 | <b>6.02</b>    | <u>\$</u>     | <b>∆</b> 0,02 | 40.02        | 40.2         |                                   |          |     |
|                 | 17             | Sh           | T              | ₽             | ㅂ             | Te           | 4L           |                                   |          |     |
|                 | <0.02          | <0.02        | <0.02          | <b>∆</b> 0.02 | 40,02         | 40,02        | 40,02        | Machine Marie                     |          |     |
|                 | Zr             | Zn           | Υ.             | \$            | <             | Ϥ            | W            |                                   |          |     |
|                 | <0.02          | <b>∆</b> 022 | A).02          | ∆.02          | <b>\$0.02</b> | A0.02        | 40.02        | TO THE REAL PROPERTY.             |          |     |

(I)= larget 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.

\* 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).

2 of 2

Part # 57115

## Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



### R1 02/09/124 Certified Reference Material CRM

M5816

CERTIFIED WEIGHT REPORT

Part Number:

Lot Number: Description:

57016 122923

Solvent:

122923

**ASTM Type 1 Water** 

Lot #

**Expiration Date:** 122926 Sulfur (S)

Nominal Concentration (µg/mL): NIST Test Number: 1000

Recommended Storage:

Ambient (20 °C)

Weight shown below was diluted to (mL): 4000.0 5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Nominal

Purity

Uncertainty Assay

Target

Actual

Uncertainty

Expanded

Reviewed By:

Pedro L. Rentas

122923

tento

Formulated By:

Benson Chan

122923

 Ammonium sulfate (S) IN117 SLBR7225V <del></del> Number Conc. (µg/mL) 1000 99.9 38 Purity (%) 0.10 24.3 38 Weight (g) 16.4979 Weight (g) Conc. (µg/mL) 16.4980 1000.0 +/- (µg/mL) 20 7783-20-2 CAS# SDS Information
(Solvent Safety Info. On Attached pg.)
LD50 ¥ orl-rat 4250mg/kg 3181 SRM

1/Z-V m/z-> m/z-> N.SES S.OEB 5.OE7 1.0**E**8 N. SES 5.0E5 [1] Spectrum No. 1 210 110 0 120 ななり 0 [ 33.603 sec]:57016.D# [Count] [Linear] 130 230 30 140 240 40 250 150 000 160 200 00 170 0 180 80 190 00 200 100

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

Part # 57016

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

(I) = larget 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).

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

Certified Reference Material CRM

109/24

M5817

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 071123 57116

Solvent:

071123

**ASTM Type 1 Water** 

Burense

Formulated By:

Lawrence Barry

071123

Lot #

**Expiration Date:** Description: 071126 Sulfur (S)

Nominal Concentration (µg/mL): NIST Test Number: 10000 Ambient (20 °C)

Recommended Storage:

EU1B

Weight shown below was diluted to (mL): 1999.48 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas SDS Information

 Ammonium sulfate (S) IN117 SLBR7225V 10000 99.9 0.10 24.3 82.4675 82,4682 10000.1 20.0 7783-20-2 Z orl-rat 4250mg/kg 3181

Number Ĕ Conc. (µg/mL) Purity 8 Uncertainty Assay Purity (%) 8 Weight (g) Target Weight (g) Conc. (µg/mL) Actual Actual +/- (µg/mL) OSHA PEL (TWA)

Expanded

071123

Uncertainty (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 SRM NIST

| m/z->       | 1.005 | m/z-><br>2.0E5 | 2.5E5 | 5.0E5      | 1000 | 2000 |
|-------------|-------|----------------|-------|------------|------|------|
|             |       |                |       |            |      |      |
| 0           |       | 110            |       | 0          |      |      |
| N<br>N<br>O |       | 120            |       | 20         |      |      |
| 230         |       | 130            |       | <b>3</b> 0 |      |      |
| 24          |       | 140            |       | 40         |      |      |
| 250         |       | 150            |       | 50         |      |      |
| 260         |       | 190            |       | 8          |      |      |
|             |       | 170            |       | 70         |      |      |
|             |       | 180            |       | 8.         |      |      |
|             |       | 190            |       | 90         |      |      |
|             |       | 200            |       | 100        |      |      |

Part # 57116

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

|                    | BE BE BE  |
|--------------------|---|
|                    | 002<br>002<br>002<br>002  |
|                    | 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2 |
| •                  | 594445  |
|                    | 40.22<br>40.22<br>40.22<br>40.22  |
|                    | <b>≥ 유요요 프 무 ▽</b>  |
|                    | 40.02<br>40.02<br>40.02<br>40.02<br>40.02   |
|                    | 8 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4   |
|                    | 40,02<br>40,02<br>40,02<br>40,02<br>40,02<br>40,02  |
|                    | Li<br>Li<br>Mg<br>Mn<br>Hg  |
| (T)= Tarnet anakre | Verifica  |
| onak.              | K P P B S S N   |
| 5                  | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$                                    |
|                    | S S S S S S S S S S S S S S S S S S S   |
|                    | (µg/mL)   |
|                    | Ta Sr Na Se   |
|                    | 40.22<br>40.02<br>40.02<br>40.02<br>40.02<br>7<br>7<br>40.02                                |
|                    | To T  |
|                    | 60000000000000000000000000000000000000  |
|                    | Z   |
|                    | 666666666666666666666666666666666666666   |

Physical Characterization:

(1)= larger analyte

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 # 57116

## Absolute Standards, Inc. 800-368-1131

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Certified Reference Material CRM

109124 M.5818

Solvent: 24002546 Nitric Acid

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

CERTIFIED WEIGHT REPORT:

Part Number:

Lot Number: Description: 57014 122023

Silicon (SI)

Nominal Concentration (µq/mL): Recommended Storage: 1000 Ambient (20 °C)

**Expiration Date:** 

122026

2%

40.0 (mL)

Nitric Acid

Formulated By:

Aleah O'Brady

122023

122023

Areah o Brasky

| Compound       |  |                 | Weight shown below was diluted to (mL): 1999.48 0.058 Flask Uncertainty | NIST Test Number          | The second secon |
|----------------|--|-----------------|---|---------------------------|--|
| RM#            |  |                 | elow was diluted  | Number:                   |  |
| Number         | Lot  |                 | d to (mL):  | 8TUB                      |  |
| Conc. (µg/mL)  | Nominal  |                 | 1999.48   |                           |  |
| (%)            | Purity   |                 | 0.058   | 5E-05                     |  |
| Purity (%)     | Nominal Purity Uncertainty Assay   |                 | Flask Uncerta   | 5E-05 Balance Uncertainty |  |
| 8              | Assay  |                 | unty  | artainty                  |  |
| Weight (g)     | Target   |                 |   |                           |  |
| Weight (g)     | Actual   |                 |   |                           |  |
| Conc. (ug/mL)  | Actual   |                 |   |                           |  |
| +/- (ug/mL)    | Uncertainty  | Expanded        |   | Reviewed By:              | /  |
| CAS#           | (Solve   |                 |   |                           |  |
| OSHA PEL (TWA) | Lot Nominal Purity Uncertainty Assay Target Actual Actual Uncertainty (Solvent Safety Info. On Attac | SDS Information |   | Pedro L. Rentas           | 1  |

|     |                                       |  |         |              |                    | 10000         | 12000       |       |                           | 00000   | 3 3 16 3   |                  |  |
|-----|---------------------------------------|--|---------|--------------|--------------------|---------------|-------------|-------|---------------------------|---------|--|------------------|--|
|     |                                       |  |         | 1            |                    |               |             |       |                           |         | 4  | INIOOD CITATORIA | amonism beyefluorosilicate (C)   Nicon succession   Apple   Ap |
|     |                                       |  |         |              |                    |               |             |       |                           |         |  |                  |  |
|     |                                       |  |         |              |                    |               |             |       |                           |         |  |                  |  |
|     | П                                     |  |         |              |                    |               |             |       |                           |         |  |                  |  |
|     | E                                     | COLIS LEE (1887)   | 5       | The Man went | Carried Cash trues | (B) 200 Bross | 183 million |       | The state of the state of |         | 400  |                  |  |
| 200 |                                       | NUMP NUMBER Conc. (143/ml.) (%) Purity (%) (%) Weight (a) Weight (b) Conc (143/ml.) CAS# OCUA DCI (74/ml.) | HOAOH   | +1/1 (12/11) | Come (sector)      | Weight (a)    | Weight (a)  | 8     | 8) All a                  | 98      | Conc. (Ja/mL)  | KM# Number       | ALI PARTICION DE LA CONTROL DE |
|     |                                       | •  |         |              |                    |               |             |       |                           |         | ,  | Disk No.         |  |
| Z   | Attached po.)                         | Uncertainty (Solvent Sallety Inio, On Attached pg.)  | (SOIVE) | Uncertainty  | ACTUAL             | ACCUAL        | raiger      | Masay | טואיפו עמוורץ             | r writy | recommend family of the control of t |                  |  |
|     | A A A A A A A A A A A A A A A A A A A | THE PLEASE OF  | 1011    |              |                    |               | Townsh      | 2000  | Incortaint.               |         | Zomina   | 2                |  |

| * | orl-mus 70 mg/kg | 2.5 mg/m3      | 2.0 16919-19-0 | 2.0             | 1000.0         | 13.8855     | 13.8854      | 14.4  | 0.10         | 99.999 | 1000 | IN009 SID082022A1  | Ammonium hexafluorosilicate (Si) IN009 sido82022A1 1000 99.999 0.10 14.4 13.8854 13.8855 1000.0 |
|---|------------------|----------------|----------------|-----------------|----------------|-------------|--------------|-------|--------------|--------|------|--|---|
|   |                  |                |                |                 |                |             |              |       |              |        |      |  |   |
|   | Esc              | COMA TEL CINA) | CAS#           | (ASA) +/- (ASA) | רטות. (ששיוור) | (A) THENDAM | (B) Millione | (101) | fact frience | (00)   | 400  | (A) mediu (A) must (w) (w) (w) mediu (A) mediu (A) conc. |   |

| 92 II                                   | CAS#  |  | CAS# OSHA PEL (TWA) LD50 SRM  1919-19-0 2.5 mg/m3 orl-mus 70 mg/kg NA          | 1. Ammonium hexafluorosilicate (Si) IN009 siposzozza1 1000 98.899 0.10 14.4 13.8854 13.8855 1000.0 2.0 169 | Compound  RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL) |
|---|---|--|--|--|---|
|   |   | Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)  1000.0 2.0 16919-19-0 2.5 mg/m3 | Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)  1000.0 2.0 18919-19-0 2.5 mg/m3 | 10 14.4 13.8   | (%) (%) Weigh   |
| Conc. (µg/mL) +/- (µg/mL) 1000.0 2.0 10 | Conc. (µg/mL) +/- (µg/mL) CAS#  1000.0 2.0 16919-19-0 |  |  | 3854 13.8855   | ht (g) Weight (g)   |
| 2.0 10                                  | 2.0 16919-19-0  |  |  | 1000.0   | Conc. (µg/mL) +   |
|   | CAS#  |  |  | 2.0  | /- (µg/mL)  |

| m/z->   | 5.085 | m/z->                                  | 1.0E6 | 2.0E6      | 2500 | 5000 |
|---------|-------|--|-------|------------|------|------|
|         |       |  |       |            |      |      |
| 210     |       | 1                                      |       | Ö.         |      |      |
| N       |       |  |       | 3          |      |      |
| 220     |       | ก<br>0                                 |       | <b>N</b> . |      |      |
| 230     |       | 130                                    |       | (a)        |      |      |
|         |       | Ψ                                      |       |            |      |      |
| N<br>40 |       | 4                                      |       | 4          |      |      |
| 250     |       | 150                                    |       | (n         |      |      |
| ö       |       | Ö                                      |       | <b>6</b>   |      | *    |
| 200     |       | 160                                    |       | 6)<br>O    |      |      |
|         |       | ************************************** |       | .d.        |      |      |
|         |       | 170                                    |       | 70         |      |      |
|         |       | 180<br>80                              |       | <b>8</b> . |      |      |
|         |       |  |       |            |      |      |
|         |       | 90                                     |       | 0          |      |      |
|         |       | 200                                    |       | 100        |      |      |

Part # 57014

1 of 2



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

| Ţ.               | <b>5</b> | B            | ķ           | 7 5   | # :    | As       | 30                                      | 2     | A            | i  | Ī        |    |
|------------------|----------|--------------|-------------|-------|--------|----------|---|-------|--------------|--|----------|----|
| ŀ                | _        | _            | _           |       |        | _        | _                                       | _     |              |  |          |    |
| 70.02            | 3        | <u> 0</u> 02 | 10.05       | 20.02 | 3 1    | 8        | 20.02                                   |       | 40.02        | The state of the s |          |    |
| 2                | ?        | င            | 7           | , Ç   | 3 8    | <u>ئ</u> | S.                                      | 1     | 2            |  |          |    |
| \$0.02           | 3        | A).02        | <0.02       | 20:02 | 3 6    | 3        | 40.2                                    | 40.04 | 20.02        | 住地に なる 日本の   |          |    |
| A                |          | ಕ್ಕ<br>ಕಾ    | G           | ğ     | 2 5    | ਜੂ<br>ਜੂ | Ē,                                      | 5     | 7            | 2000 mg/mg/  |          |    |
| 20.02            |          | A) (2)       | A)22        | 40.52 | 6.02   | 3        | 40.02                                   | 20.02 | 000          |  |          |    |
| Ğ                | ! }      |              | <b>'</b>    | H     | ۱ ا    | 7        | 픙                                       | 111   | AB.          |  |          | ٠  |
| 40.02            | 40.0     | 3            | <b>60.2</b> | 40.02 | 20.02  | 3        | <b>∆</b> .02                            | 20.02 | 000          | SOMEON PROPERTY.   | Hace M   | ,  |
| Nd               | 10.00    | 5            | 8H          | Mn    | . 00   |          | Ē                                       | E     | 1            |  | verais   |    |
| <0.02            | 10.07    | 3            | <b>6</b> 20 | 40,02 | 10.03  | 2        | <b>∆</b> 0,02                           | 20.02 |              |  | Verifica | 11 |
| ×                | 2        | Ş            | ٦           | Pd    | ç      | ,        | \$                                      | 2     | 1            |  | HOD      |    |
| 40.2             | 20.02    | 3            | ∆.02        | 40,02 | 40.02  |          | 8.00                                    | 20.02 |              | ŀ  | by ICP-I |    |
| જ                | 300      | 2            | ₽           | R     | 2      | !        | <b>7</b>                                | 7     |              | ļ  | E S      |    |
| 40.02            | 20.02    | 3            | 40.02       | 20.0≥ | 40.02  |          | 8                                       | <0.02 |              | ľ  | g/mL)    |    |
| Ta               | v        | ,            | S.          | Z     | A<br>S |          | 2                                       | Se    |              |  |          | I  |
| <b>&amp;</b> .02 | 20.02    | 3            | 83.6        | 40.2  | 40.02  |          | -1                                      | 40.2  |              | -  |          |    |
| Ħ                | Sn       | ,            | ď           | Ħ     | Ħ      | ,        | 7                                       | 7     |              |  |          |    |
| 40.02            | 20.02    |              | 20.02       | 40.02 | 40.02  | 20.02    | 3                                       | 40.02 |              | The Real Property lies   |          |    |
| Z                | 70       | ,            | <b>~</b>    | \$    | <      | -        | ======================================= | ¥     |              |  |          |    |
| <b>∆</b> 0.02    | 40.02    | 1010         | <b>A</b>    | 40.02 | 40.02  | 10.02    | 3                                       | 40.02 | O) SOUTHWOOD |  |          |    |

(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.

\* 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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Certified Reference Material CRM

2 02/na

ング

Solvent: 24002546

Nitric Acid

F Lot #

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: 58030

Description:

111623 Zinc (Zn)

Ambient (20 °C) 111626

**Expiration Date:** 

Nominal Concentration (µg/mL): Recommended Storage:

**NIST Test Number:** 

**BTU9** 1000

5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Weight shown below was diluted to (mL):

3000.4

5

Nominal

Purity

Uncertainty Assay

Target

Actual

Actual

Uncertainty

Expanded

84 60.0 <u>a</u>

Nitric Acid

Formulated By: Benson Chan

111623

Reviewed By: Pedro L. Rentas

111623

Zinc nitrate hexahydrate (Zn) Compound [1] Spectrum No.1 [ 31.103 sec]:58130.D# [Count] [Linear] IN016 ZNE032021A1 RM# Number Conc. (µg/ml.) 1 000 99.999 8 Purity (%) 0.10 24.3 3 Weight (g) 12.3475 Weight (g) Conc. (µg/ml.) 12.3502 1000.2 +/- (µg/mL) 2.0 10196-18-6 CAS# OSHA PEL (TWA) orl-rat 1190mg/kg 3168



(Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 **SDS** Information SRM SRM

200

100

Part # 58030

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

|                | BE BE S S A   | Г        |  |
|----------------|---|----------|--|
|                | 4002<br>4002<br>4002<br>4001<br>4002<br>4002                |          |  |
|                | 585855  |          |  |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   |          |  |
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|                | 000000000000000000000000000000000000000                     |          |  |
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|                | Mo Mg LL  | letals   |  |
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|                | X Y T R Q S Y X   | tion     |  |
|                | 40.22<br>40.22<br>40.22<br>40.22                            | by ICP-  |  |
|                | S E E E E F   | Š        |  |
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|                | Ta Sr Za Ag   |          |  |
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|                | \$ 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8                    |          |  |

(I) = larget analyte

## Physical Characterization:

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

Certified by:

<sup>\*</sup> 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.

<sup>\*</sup> 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.

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

<sup>\*</sup> 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. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Lot #

Part Number: Lot Number: Description: 57015 091123 Phosphorous (P) Solvent: 24002546 2% 40.0 Nitric Acid Nitric Acid

Formulated By:

Lawrence Barry

091123

Pedro L. Rentas

091123

**SDS** information

rento

Nominal Concentration (µg/mL): Recommended Storage: **Expiration Date:** 1000 091126 Ambient (20 °C) (JE)

Weight shown below was diluted to (mL): **NIST Test Number:** BITUB Lot 2000.02 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Actual Uncertainty Reviewed By: Expanded

 Ammonium dihydrogen phosphate (P) IN008 Pvos2018A1 [1] Spectrum No.1 RM# Number [ 12.074 sec]:58115.D# [Count] [Linear] Conc. (µg/mL) 1000 99.999 3 Purity (%) 0.10 27.5 3 Weight (g) 7.2729 Weight (g) Conc. (µg/mL) 7.2730 1000.0 +/- (µg/mL) 2.0 7722-76-1 CAS# (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 5 mg/m3 rl-rat >2000mg/ki 3186 SRM

Part # 57015

--z/m

210

220

230

240

250

260



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

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

|                | ľ            | В        | <u> </u> | Ħ.            | 뮸             | 200           | Ę,            | 3            |                | ş                                       | 2            | 4              |          |          |
|----------------|--------------|----------|----------|---------------|---------------|---------------|---------------|--------------|----------------|---|--------------|----------------|----------|----------|
|                |              | A 022    | 20.02    | 3             | -<br>60<br>10 | 70.02         | 3             | 70           |                | <b>A</b>                                | 2002         | 200            |          |          |
| ř.             |              | <u>ნ</u> | 8        | ,             | <del>Ω</del>  | Ç             | ?             | g            |                | ვ.<br>                                  | 2            | 2              |          |          |
|                |              | A<br>23  | 20705    | 3             | A<br>20.02    | 20.02         | 3             | 40.02        |                | 2                                       | 20,02        | 3              |          |          |
|                |              | A II     | Ę        | 1             | ට<br>ව        | 2             | 2             | 달            | 2              | Į,                                      | Ų            |                |          |          |
|                |              | 3        | 40.02    |               | 3             | <b>♦0.02</b>  | )             | 8            | 20.02          | 3                                       | <b>∆</b> .02 |                |          |          |
|                |              | ÿ        | <u>_</u> |               | ₹1            | 4             |               | <u> </u>     | 0.0            | F .                                     | H            | 1              |          |          |
|                | 2000         | 3        | <u> </u> | 4.4           | 3             | <b>∆</b> 02   |               | <b>6</b> 002 | 20.02          | 3                                       | 40.02        | -              |          | Trace M  |
|                | i            | ž        | š        | 200           | Ç             | ¥             | 9             | <b>X</b>     | Į,             | •                                       | 5            |                |          | <u>P</u> |
| 3              | 20,02        | 3        | <u>8</u> | 202           | 3             | <b>∆</b> 0,02 | 1000          | <u>^</u>     | 40,02          | 2                                       | A 0,02       |                |          | Verifica |
| Target         | ŀ            | 4        | 7        | 7             | ,             | Z             | Ş             | Ş            | S              |   | Z            |                |          | †:<br>   |
| Target analyte | ê            | 9        | A)       | _             |               | 8             | 10:04         | 3            | A0.02          |   | A) (2)       |                | 3        | אי וכפרו |
|                | Se.          | •        | S        | ¥.            | ,             | <b>₽</b>      | 2             | <b>P</b>     | ₽              | :                                       | Ŗ            | Manager Street | F        | 100      |
|                | 40.02        |          | A<br>S   | 40.02         |               | A             | 70.05         | 3            | <u>\$</u> 0.02 | *************************************** | A            |                | g/ IIIL) | 7        |
|                | Ta           | ,        | ^        | ş             |               | Z.            | A             | •            | S              | ş                                       | ß            | SANSON COM     |          |          |
|                | 40.02        | 70.02    | 3        | <b>∆</b> 0,02 | i d           | 3             | 20,02         | 3            | <b>∆</b>       | ć                                       | 3            |                |          |          |
|                | 111          | ě        | ?        | Ĭ'n           | Ē             | <b>;</b>      | Η             | !            | 7              | č                                       |              |                |          |          |
|                | <b>40.02</b> | 70.02    | 3        | <b>∆0,02</b>  | 2000          | 3             | <b>∆</b> 0.02 | 2            | 200            | 20.02                                   | 300          |                |          |          |
|                | Zr           | 2        | 7        | <u>~</u>      | 16            | \$            | \<br>-        |              | 9              | *                                       |              |                |          |          |
|                | 40.02        | 20.02    | 3        | 20.02         | 70.0>         | 3             | <u>6</u> 0.02 |              | A) (2)         | 20.02                                   |              |                |          |          |

### 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).



### 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

### **ACCREDITATION / REGISTRATION** 1.0

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:

Yttrium

Starting Material:

Yttrium Oxide

Starting Material Lot#:

2661 and 06230520YL

Starting Material Purity:

99.9984%

### **CERTIFIED VALUES AND UNCERTAINTIES** 3.0

**Certified Value:** 

 $10000 \pm 30 \mu g/mL$ 

Density:

1.032 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

Assay Method #1

10011 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #2

9997 ± 50 µg/mL

ICP Assay NIST SRM 3167a Lot Number: 190730

Assay Method #3

9984 ± 31 µg/mL

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<sub>i</sub> = mean of Assay Method I with standard uncertainty uchar 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 (±) =  $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ 

k = coverage factor = 2

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$  where  $u_{char}$  i are the errors from each characterization method

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

u<sub>its</sub> = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### - ------

Characterization of CRM/RM by One Method
Gertified Value, Xanuary, where one method of characterizat

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

XCDM/DM = (Xa) (Uchar a)

X<sub>a</sub> = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k (u^2_{char} a + u^2_{bb} + u^2_{lts} + u^2_{ts})^{V_2}$ 

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

u<sub>ts</sub> = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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.

| M | Ag | < | 0.004600 | М | Eu |   | 0.009037 | М | Na |   | 0.086360 | M: | Se | < | 0.005200 | M | Zn |   | 0.030125 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|----|----|---|----------|---|----|---|----------|
| M | Al |   | 0.014862 | 0 | Fe |   | 0.002410 | М | Nb | < | 0.000570 | 0  | Si |   | 0.024100 | 0 | Zr | < | 0.002600 |
| М | As | < | 0.003500 | М | Ga | < | 0.000570 | M | Nd |   | 0.000923 | M  | Sm |   | 0.000461 |   |    |   |          |
| М | Au | < | 0.001700 | М | Gd | < | 0.003500 | M | Ni | < | 0.005700 | M  | Sn | < | 0.002300 |   |    |   |          |
| 0 | В  |   | 0.002209 | M | Ge | < | 0.005200 | M | Os | < | 0.001200 | M  | Sr | < | 0.004600 |   |    |   |          |
| 0 | Ba | < | 0.002500 | М | Hf | < | 0.000570 | n | Р  | < |          | M  | Ta | < | 0.000570 |   |    |   |          |
| 0 | Be | < | 0.001400 | М | Hg | < | 0.000570 | M | Pb |   | 0.005020 | M  | Tb |   | 0.001044 |   |    |   |          |
| M | Bi | < | 0.003500 | М | Но |   | 0.009037 | М | Pd | < | 0.005100 | М  | Te | < | 0.002300 |   |    |   |          |
| 0 | Ca |   | 0.009841 | М | In | < | 0.002300 | М | Pr | < | 0.002300 | М  | Th | < | 0.000570 |   |    |   |          |
| M | Cd | < | 0.000570 | М | lr | < | 0.000570 | M | Pt | < | 0.000570 | M  | Ti | < | 0.003500 |   |    |   |          |
| M | Ce | < | 0.002300 | 0 | K  |   | 0.018677 | М | Rb | < | 0.000570 | М  | TI | < | 0.000570 |   |    |   |          |
| M | Co | < | 0.000570 | M | La |   | 0.000461 | М | Re | < | 0.000570 | М  | Tm | < | 0.003500 |   |    |   |          |
| M | Cr | < | 0.004000 | 0 | Li | < | 0.009300 | М | Rh | < | 0.008000 | M  | U  | < | 0.000570 |   |    |   |          |
| M | Cs | < | 0.000570 | M | Lu |   | 0.000582 | М | Ru | < | 0.000570 | M  | V  |   | 0.001265 |   |    |   |          |
| M | Си |   | 0.002610 | 0 | Mg |   | 0.001486 | n | S  | < |          | M  | W  | < | 0.002300 |   |    |   |          |
| М | Dy |   | 0.003815 | М | Mn |   | 0.000582 | М | Sb |   | 0.005422 | S  | Υ  | < |          |   |    |   |          |
| M | Er |   | 0.003615 | M | Мо | < | 0.005700 | М | Sc | < | 0.001200 | M  | 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>, <a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. 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

chemically stable for years in 2-5% HNO3 / LDPE container.

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

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

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axiai 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** 

Mayyand Man Paul R. Laine

### Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director

## Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



### Certified Reference Material M5960

スズ

Lot #

| ANAB ISO<br>AR-1539 C<br>https://Absolo |  |
|---|--|
|   |  |
| 124                                     |  |

| CRM /      | ANAB ISO 1<br>AR-1539 Ce<br>https://Absolut |
|------------|---|
| 1. 6/11/24 | -   |
|            |   |
| Acid       | 1   |

| Solvent: 24002546 Nitric Acid | Nitric Acid | J.             |                 |        |
|-------------------------------|-------------|----------------|-----------------|--------|
| 2% 5.0<br>(mL)                | Nitric Acid | Formulated By: | Brian Geddes    | 041124 |
| Uncertainty                   |             | Reviewed By:   | Pedro L. Rentas | 041124 |

5E-05 Balance Uncertainty 0.002 Flask Uncertainty

249.85

**6UTB** 1000

NIST Test Number:

Weight shown below was diluted to (mL):

Ambient (20 °C)

Recommended Storage: Nominal Concentration (µg/mL):

**Expiration Date:** 

041127

57028 041124 Nickel (NI)

Part Number: Lot Number: Description:

CERTIFIED WEIGHT REPORT:

|                 | NIST                                   | SRM                                  |  |
|-----------------|--|--------------------------------------|--|
| _               | tached pg.)                            | LDSO                                 |  |
| SDS Information | (Solvent Safety Info. On Attached pg.) | OSHA PEL (TWA)                       |  |
|                 | (Sol                                   | CAS#                                 |  |
| Expanded        | Uncertainty                            | +/- (µg/mL)                          |  |
|                 | Actual                                 | Weight (g) Conc. (ug/mL) +/- (µg/mL) |  |
|                 | Actual                                 | Weight (g)                           |  |
|                 | Target                                 | Weight (g)                           |  |
|                 | Assay                                  | (%)                                  |  |
|                 | Uncertainty Assay                      | Purity (%) (%)                       |  |
|                 | Purity                                 | (%)                                  |  |
|                 | Nominal                                | Conc. (µg/mL)                        |  |
|                 | Lot                                    | Number                               |  |
|                 |  | RM#                                  |  |
|                 |  |                                      |  |
|                 |  | Compound                             |  |

| orl-rat 1620 mg/kg 31 | r mg/m3 | 13478-00-7                               | 2.0 | 1000.0 | 5003-  | 2003   | 20.7 |      | 2000   |      |                   |                                     |
|-----------------------|---------|--|-----|--------|--------|--------|------|------|--------|------|-------------------|-------------------------------------|
|                       | ,       | 00 000 0 10 10 10 10 10 10 10 10 10 10 1 | c   | 0 0001 | 1 2360 | 1 2360 | 20.0 | 0 10 | 000 00 | 1000 | IN033 NIM052023A1 | Nickel(II) nitrate hexahvdrate (Ni) |
|                       |         |  |     |        |        |        |      |      |        |      |                   |                                     |
|                       |         |  |     |        |        |        |      |      |        |      |                   |                                     |



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





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

| L  |       |    |       |    |       | ľ              |          | 1    |        |        |          |     |                |     |               |   |                |     |       |
|----|-------|----|-------|----|-------|----------------|----------|------|--------|--------|----------|-----|----------------|-----|---------------|---|----------------|-----|-------|
|    |       |    |       |    |       |                | Irace Me | tals | Verifi | cation | by ICP-N | Š   | $(\mu g/mL)$   |     |               |   |                |     |       |
|    |       |    |       |    |       |                |          |      |        |        |          |     |                |     |               |   |                |     |       |
| Ψ  | <0.02 | 3  | <0.02 | Dy | <0.02 | HŁ             | <0.02    | Ľ    | <0.02  | ž      | T        | ď.  | <0.02          | Se  | <0.2          | Th                                      | <0.00×         | 3   | L     |
| Sb | <0.02 | ౮  | <0.2  | 山  | <0.02 | Но             | <0.02    | Ľ    | <0.02  | Nb     | <0.02    | Re  | <0.02          | V.  | 20.05         | - E                                     | 20:07          | = = |       |
| As | <0.2  | ೦  | <0.02 | En | <0.02 | П              | <0.02    | Mg   | <0.01  | č      | 000      | 72  | 9              |     | 000           | ÈF                                      | 70:07          | ) ; |       |
| Ba | <0.02 | ర  | <0.02 | PS | <0.02 | Ļ              | <0.00    | , Ž  | 2007   | Ъ      | 600      | 70  | 20:05          | 0 N | 70.07         | 7 F                                     | 20.02          | > ; |       |
| Be | <0.01 | Ö  | <0.02 | Ga | <0.02 | نه<br><u>آ</u> | 202      | Но   | 2007   | 2      | 70:07    | 2 2 | 20.05<br>-0.02 | N C | 7.0>          | = F                                     | <0.02          | χ.  |       |
| Bi | <0.02 | රි | <0.02 | Ge | <0.02 | Į,             | 0.00     | N S  | 20.02  | - 4    | 20:02    | Z Z | 20.02          | i c | <0.02         | E .                                     | <0.02          | × 1 | <0.02 |
| В  | <0.02 | ī, | <0.02 | Au | <0.02 | Pb             | <0.02    | PN   | <0.02  | : ×    | 20.02    | 5   | 20.02<br>CO 02 | o E | <0.02<br>0.02 | G ::                                    | <0.02<br>20.02 | U - |       |
|    |       |    |       | -  |       |                |          |      |        |        | 7:00     | 2   | 70'07          | 14  | 70.07         | ======================================= | <0.02          | 7   |       |

(T) = Target analyte

### Physical Characterization:

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





the preparation of all standards,

<sup>\*</sup> 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.

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.

<sup>\*</sup> 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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## Certified Reference Material CRM

M5962 R! 06/14/24



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| m/z-> |       | io<br>io | m/z->   | -     | Ņ | m/z->          | i i                                   | 1. Selenium (Se)   | Compound                             |  | <                                       |                     | Nominal Co                     | Re                   |                |                             | CERTIFIED WEIGHT HEPOHT | מדודודה שובום |
|-------|-------|----------|---------|-------|---|----------------|---------------------------------------|--------------------|--------------------------------------|--|---|---------------------|--------------------------------|----------------------|----------------|-----------------------------|-------------------------|---------------|
| 210   | 1.OE8 | 2.008    | 110     | 1.OE8 |   | 10             | [1] Spectrum No.1                     |                    |                                      |  | Volume shown below was diluted to (mL): | NIST Test Number:   | Nominal Concentration (µg/mL): | Recommended Storage: | 1              | Lot Number:<br>Description: | Part Number:            | 1 11000H      |
| 0     |       |          | 0       |       |   | Ü              | Z 2 0                                 | 58134              | Number                               | Part                                   | as dilute                               |                     |                                |                      |                | in in in                    | _                       |               |
| 220   |       |          | 120     |       |   | 20             | -                                     | 071223             | Number                               | Lot                                    | d to (mL):                              | 6UTB                | 1000                           | Ambient (20 °C)      |                | 060624<br>Selenium (Se)     | 57034                   |               |
| Ŋ     |       |          | <u></u> |       |   | ω              | 3.702                                 | 0.1000             | Factor                               | Dilution                               | 2000.07                                 |                     |                                | <u>ග</u>             |                | Se)                         |                         |               |
| 230   |       |          | 130     |       |   | 30             | sec]:58                               | 200.0              | Vol. (mL                             | Initial                                | 0.100                                   | 5E-05               |                                |                      |                |                             |                         |               |
| 240   |       |          | 140     |       |   | 40             | 33.702 sec]:58034.D# [Count] [Linear] | 0.084              | Val. (mL) Pipette (mL) Conc. (μg/mL) | Uncertainty                            | Flask Uncertainty                       | Balance Uncertainty |                                |                      |                |                             |                         |               |
| 250   |       |          | 150     |       |   | 50             | Count) [L                             | 1000               | Conc. (µg/mL)                        | Nominal                                | ťγ                                      | ainty               |                                |                      | 2.0%           | 24007540                    | 24002546                |               |
| 260   |       |          | 160     |       |   | . 60           | inear                                 | 10002.5            | Conc. (µg/mL                         | Initial                                |   |                     |                                | (m_C)                | 40.0           | Na Contraction              | Solvent:                |               |
| o     |       |          |         |       |   | 12<br>33<br>34 |                                       | 1000.0             | Conc. (µg/mL) Conc. (µg/mL)          | Final                                  |   |                     |                                |                      | Nitric Acid    |                             |                         | (1)           |
|       |       |          | 170     |       |   | 70             |                                       | 2.2                | .) +/- (µg/mL)                       | Uncertainty                            | Expanded                                | Reviewed By:        | ta                             | N                    | Formulated By: | M                           |                         | 10            |
|       |       |          | 180     |       |   | 80             |                                       | 7782-49-2          | C                                    | (So                                    |   | y:                  | 1 to                           | 11                   | By:            |                             |                         |               |
|       |       |          | 190     |       |   | 90             |                                       | 2 0.2 mg/m3        | OSHA PEL (TWA)                       | (Solvent Safety Info. On Attached pg.) | SDS Information                         | Pedro L. Rentas     | leenes                         |                      | Benson Chan    | M                           |                         |               |
|       |       |          | 2200    |       |   | 100            |                                       |                    | VA)                                  | ). On Atta                             | rmation                                 | ntas                | ,                              | /                    | ב              | 5                           |                         |               |
|       |       |          |         |       |   | -              |                                       | orl-rat 6700 mg/kg | 1.050                                | ched pg.)                              |   | 060624              |                                |                      | 060624         |                             |                         |               |
|       |       |          |         |       |   |                |                                       | 3149               | SRM                                  | NIST                                   |   | ٿ                   |                                |                      | 1+2            |                             |                         |               |

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

|    |       |     |       |    |       |    | I race M | 1etals | Verifica | lion | oy ICP-M | S (1) | g/mL) |    |       |    |       |    |       |
|----|-------|-----|-------|----|-------|----|----------|--------|----------|------|----------|-------|-------|----|-------|----|-------|----|-------|
| Al | <0.02 | CG  | <0.02 | Dγ | <0.02 | HH | <0.02    | 11     | <0.02    | Z.   | <0.02    | Pr    | <0.02 | Se | H     | 16 | 40.02 | W  | 40,02 |
| SЪ | <0.02 | ದ್ದ | <0.2  | 퍜  | <0.02 | 풘  | <0.02    | Į.     | <0.02    | ₽    | <0.02    | Re    | <0.02 | S: | <0.02 | Te | <0.02 | U  | <0.02 |
| As | <0.2  | ಕಿ  | <0.02 | 핃  | <0.02 | Ы  | <0.02    | Mg     | <0.01    | °    | <0.02    | Rh    | 40.02 | Ag | <0.02 | ∄  | 40.02 | ۷  | <0.02 |
| Ва | <0.02 | င္တ | <0.02 | æ  | <0.02 | H. | <0.02    | Mn     | <0.02    | Pd   | 40.02    | ₽.    | <0.02 | Na | <0.2  | Ħ  | <0.02 | 4  | <0.02 |
| Ве | 40.01 | ť   | 40.02 | Ga | <0.02 | Fe | <0.2     | Hg     | A02      | P    | <0.02    | Ru    | 40.02 | Sr | <0.02 | Tm | <0.02 | ¥  | <0.02 |
| Bi | 40.02 | င္ပ | <0.02 | ଦୁ | <0.02 | Ľ  | <0.02    | Mo     | <0.02    | 7    | <0.02    | Sm    | 40.02 | S  | <0.02 | Sn | 40.02 | Zn | <0.02 |
| В  | <0.02 | Cι  | <0.02 | Au | <0.02 | Pb | <0.02    | M      | <0.02    | ×    | 40.2     | Sc    | <0.02 | Ta | <0.02 | Ħ  | <0.02 | Zr | <0.02 |

(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.
- \* 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 WEIGHT REPORT:
Part Number:
Lot Number: Lithium nitrate (Li) Nominal Concentration (µg/mL): m/z-> Recommended Storage: Volume shown below was diluted to (mL): NIST Test Number: **Expiration Date** [1] Spectrum No.1 [ 32.093 sec]:58003.D# [Count] [Linear] Description: 210 10 Part Lot Number Number 58103 070622 0.1000 57003 062124 Lithium (Li) 6UTB 062127 Ambient (20 °C) 1000 220 120 20 250.11 230 25.0 0.004 Initial Uncertainty Nominal Initial Final

Vol. (mL) Pipette (ml.) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) 0.016 Flask Uncertainty 5E-05 Balance Uncertainty HEBSON OF PSON 240 40 1000 24002546 Lot# 2.0% 250 150 50 Nitric Acid Solvent: 10000.4 (mL) 260 1000.0 Nitric Acid 7/01/24 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Giovannie Capacito 2.0 7790-69-4 5 mg/m3 orl-rat 1426 mg/kg NA SDS Information
(Solvent Safety Info. On Attached pg.)
CAS# OSHA PEL (TWA) LD50 Pedro L. Rentas Giovanni Esposito 9 0 062124 062124 SRM

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**\$** 

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

| 40.02<br>40.01 | 40.2<br>40.02  | 40.2<br>40.02 | 40.2  |       | <0.02 | <0.02 |              |   |           |   |
|----------------|----------------|---------------|-------|-------|-------|-------|--------------|---|-----------|---|
| 8 ជ ជ          | <del>ა</del> ზ | S             |       | င့    | Ca    | Ω     |              |   |           |   |
| <0.02          |                | <0.02         | <0.02 | <0.02 | <0.2  | <0.02 |              |   |           |   |
|                | ဝွ             | Ga            | Gd    | Eu    | 먁     | Ьy    |              |   |           |   |
| 3              | <0.02          | <0.02         | <0.02 | <0.02 | <0.02 | 20.02 |              |   |           |   |
| Pb             | ŗ              | æ             | 뉵     | Ħ     | Но    | H     | 1            |   |           |   |
| 40.02          | <0.02          | <0.2          | <0.02 | <0.02 | <0.02 | 20.02 |              |   | Trace V   |   |
| NA             | Мо             | Hg            | Mn    | Mg    | Lu    | Ē     |              |   | etals     |   |
| <0.02          | <0.02          | <0.2          | <0.02 | <0.01 | <0.02 | -     | 3            |   | Verifica: |   |
| ×              | 7              | P             | Pd    | Ç     | 8     | 1 2   | Z.           | ľ | tion b    | ١ |
| <0.2           | <0.02          | <0.02         | 40.02 | 20.02 | 20.02 | 0.02  | A            | ľ | V CP-V    | ١ |
| Sc             | Sm             | Ku            | 8     | 1 5   | 1 6   | :     | P            |   | ori) Si   | ۱ |
| <0.02          | <0.02          | 20.02         | <0.02 | <0.02 | 50.02 | 5 6   | <0.02        |   | <u></u>   | ١ |
| Ta             |                | , H           | N     | 3v    | 2     | 2 !   | Se           | ۱ |           | I |
| 20.02          | 20.02          | 20.02         | 100   | 40.02 | 0.00  | 3     | <b>€</b> 0.2 |   |           |   |
| -              | 1 1            | ? [           | 1 :   | 1 :   | 3 5   | 7     | dE           |   |           | I |
| 20.02          | 40.02          | 3 6.02        | 3 6   | 0.02  | 0.00  | 2     | <0.02        |   |           |   |
| E              | 7 1            | 7,            | < ?   | \$ .  | < 0   | =     | W            |   |           |   |
| 20.02          | 40.02          | 200           | 3 8   | 3 8   | 000   | <0.02 | <0.02        |   |           |   |

(T) = Target analyte

### Physical Characterization:

Al Sh As Ba Ba Bi

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

Certified by:

|   | Puri   | 굺        |
|---|--|----------|
|   | Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in | certifi  |
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the preparation of all standards.

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

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

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

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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:** 

Single Analyte Custom Grade Solution

Catalog Number:

CGMO1

Lot Number:

T2-MO720876

Matrix:

**H2O** 

tr. NH40H

Value / Analyte(s):

1 000 µg/mL ea:

Molybdenum

Starting Material:

Ammonium Molybdate

Starting Material Lot#:

2361

Starting Material Purity: 99.9893%

### 3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Value:** 

 $998 \pm 7 \, \mu g/mL$ 

Density:

1.000 g/mL (measured at 20 ± 4 °C)

### Assav Information:

**Assay Method #1** 

998 ± 4 µg/mL

ICP Assay NIST SRM 3134 Lot Number: 130418

- 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>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<sub>i</sub> = mean of Assay Method : with standard uncertainty uchar i

wi = the weighting factors for each method calculated using the inverse square of

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

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{cs})^{1/2}$ 

k = coverage factor = 2

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$  where  $u_{char}$  are the errors from each characterization method

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

u<sub>(s</sub> = transport stability standard uncertainty

### 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<sub>CRM/RM</sub> = (X<sub>a</sub>) (u<sub>char a</sub>)

X<sub>a</sub> = mean of Assay Method A with

ucher a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

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### 4.0 TRACEABILITY TO NIST

- 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.

```
0.008000 M Zn
M Ag <
          0.000590 M Eu <
                           0.000300 M Na
                                            0.000879 M Se <
                                                                               0.000598
M AI
          0.000563 M Fe <
                          0.006500 M Nb <
                                            0.029000 i
                                                       Si <
                                                                     M Zr <
                                                                               0.001800
M As <
         0.002100 M Ga <
                          0.000300 i
                                     Nd <
                                                   M Sm <
                                                              0.000300
M
   Au <
         0.000300 M Gd <
                          0.000300 M Ni <
                                            0.008000 M Sn <
                                                              0.008900
М
   B <
         0.003300 M
                    Ge <
                          0.000300 M Os <
                                            0.000590 M Sr
                                                              0.000175
                           0.001800 i
М
   Ba
          0.001689 M
                    Hf <
                                     P <
                                                   М
                                                      Ta <
                                                             0.004200
M
  Be <
         0.000890 M Hg <
                          0.003300 M Pb <
                                            0.000300 M
                                                      Tb <
                                                              0.000300
         0.000890 M Ho < 0.000300 M Pd <
M Bi <
                                            0.001800 M
                                                      Te <
                                                             0.021000
  Ca
         0.006334 M In < 0.032000 M Pr <
0
                                            0.013000 M Th <
                                                             0.000300
O Cd <
         0.026000 M Ir < 0.000300 M Pt <
                                            0.000300 O Ti <
                                                             0.032000
M Ce <
         0.008300 M K
                           0.130213 M Rb
                                            0.004575 M TI
                                                             0.001266
M Co
         0.000598 M La < 0.000300 M Re < 0.000300 M Tm <
                                                              0.000300
                           0.000059 M Rh <
M Cr
         0.000527 O Li
                                            0.000300 M U <
                                                             0.005300
M Cs
         0.000527 M Lu <
                           0.000300 M Ru <
                                            0.079000 M V <
                                                             0.000890
М
   Cu
         0.002252 M Mg
                           0.000563 i
                                     S <
                                                   M W
                                                             0.087982
М
   Dy <
         0.000300 M
                    Mn <
                           0.005900 M
                                     Sb
                                            0.001513 M Y <
                                                             0.000300
М
  Er <
         0.000300 s
                    Mo <
                                  M
                                     Sc <
                                            0.001200 M Yb <
                                                             0.000300
```

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

- 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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94 +6 6,7,8,9 [MoO4]-2(chemical form as received)

Chemical Compatibility -Mo is received in a NH4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-2. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the [MoO4]-2 chemical form.

**Stability -** 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH40H in a LDPE container.

Mo Containing Samples (Preparation and Solution) -Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or HCl).

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 95 amu      | 3 ppt                | n/a   | 40Ar39K16O,79Br1                            |
|                    |                      |       | 6O,190Os2+,190Pt                            |
|                    |                      |       | 2+  |
| ICP-OES 202.030 nm | 0.008 / 0.0002 µg/mL | 1     | Os, Hf                                      |
| ICP-OES 203.844 nm | 0.012 / 0.002 μg/mL  | 1     |   |
| ICP-OES 204.598 nm | 0.012 / 0.001 µg/mL  | 1     | Ir, Ta                                      |

### 8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRWRM.

### 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

July 17, 2022

- The certification is valid within the measurement uncertainty specified provided the CRMRM 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

- July 17, 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 Prepared By:

Uyen Truong Supervisor, Product Documentation

Meyer Trusing

### **Certificate Approved By:**

Michael Booth Director, Technical Michael 2 Booth

### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director Paul R Saine

### Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

info@inorganicventures.com P: 800-669-6799/540-585-3030 P: 540-585-3030 R:2/22/24

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



### ACCREDITATION / REGISTRATION

Number QSR-1034). 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 (GSR Certificate INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for

### PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

2% (v/v) HNO3 :xintsM T2-TI719972 Lot Number:

muineill 1 000 hg/mL ea: Value / Analyte(s): tr. HF

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

1002 ± 5 µg/mL Certified Value: **CERTIFIED VALUES AND UNCERTAINTIES** 

1.012 g/mL (measured at 20  $\pm$  4 °C) Density:

Assay Information:

ICP Assay NIST SRM 3162a Lot Number: 130925 1002 ± 4 µg/mL Assay Method #1

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  $\frac{1}{1000}$ 

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

 $(x_0) \ (x_0) \ (x_0$ 

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

Characterization of CRM/RM by One Method Characterization of CRM/RM by Two or More Methods

4.0 TRACEABILITY TO NIST

- 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

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

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 III bA-Bitter of ore each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of the property of the property

e2 M 078220.0 > gN O 882000.0 > u3 M 8g < 0.000536 M Eu <

### ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to

Page 2 of 4

INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

> uR M 882000.0

> 9A M 886 0.000.0

> bq M 882000.0 > rq M 888200.0 > rq M 682000.0 > dg M 271100.0

> q O f81200.0 > dq M f82800.0

> iN O 882000.0 > aO M 841200.0

> dN O 322500.0 > N M 862000.0

M - Checked by ICP-MS

Mn < Mg < Li <

> 0H

> 6H

ΉŁ

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

M 976800.0 > 8 i 84500.0 M 576800.0 > 8 M 782600.0

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

> mT M 882000.0 > U M 882000.0 > V M 682000.0 W M

> 6T M 882000.0 > AT M 882000.0

sT M 034450.0 > dT M E70100.0

s 852000.0 M 882000.0

O.000269 O

O.043560 O

n2 M 068010.0 89Z000.0 > mS M 89Z000.0

> II

JS

674000.0 228610.0

892000.0 892000.0

0.000268

699630.0

0.001341

892000.0

0.010560

960000'0

960000.0

73260.0 > nZ O 402100.0 038540.0 > nZ O 267400.0

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

7.7 Storage and Handling Recommendations

oM M 882000.0

0.000268 M K 0.000268 M K 0.000268 M K

0.000872 O Fe > 0.008586 M Ga <

O 892000.0

O S37000.0 M 882000.0

M 882000.0

M 603100.0

M 885800.0

M £83200.0 > 00 M GG8020 O.004577 M Gd <

INTENDED USE

W Et < O Cn <

O B <

IA O

### 4.1 Thermometer Calibration

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

### Page 3 of 4

- Chemical Testing - Accredited / AZLA Certificate Number 863.01

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

- QSR Certificate Number QSR-1034

1.01 ISO 9001 Qualify Management System Registration

### MOITATY STANDARD DOCUMENTATION 0.01

Homogeneity data indicate that the end user should take a minimum ample size of 0.0.2 m L to assume

This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. The Coth series alongs mirranament to be the Coth of the Coth series alongs mirranament to be the Coth series alongs mirranament.

### HOMOGENEITY

Please refer to the Safety Data Sheet for information regarding this CRWRM.

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

| Ollinger  |           | C INTOTINATION (ICP_OEC n.    | Idoseones                |     |
|---|-----------|-------------------------------|--------------------------|-----|
| ss radial/axial view):                                      | are given | Estimated D.L. Estimated D.L. | Technique/Line           |     |
| Interferences (Underline 11 )                               | Order     | idq 41                        | ICP-MS 48 amu            |     |
| Interferences (underlined indicates severe) 32S16O, 32S14N, | A/N       | add                           |                          |     |
| 14N160180,  |           |                               |                          |     |
| 14N17N2, 36Ar12C,   |           |                               |                          |     |
| 48Ca, [96X=2  |           |                               |                          |     |
| 7-Vool (no o  |           |                               |                          |     |
| (where X = Zr, Mo,<br>Ru)]                                  |           | 10000 () 1900 ()              | ICP-OES 323.452 nm       |     |
| Ce, Ar, Ni  |           | Jm/gu Se000.0 \ +200.0        | ICP-0ES 334.941 nm       |     |
|   |           | m/pu 820000.0 \ 8500.0        | ICP-0ES 336.121 nm       |     |
| ла, Та, Сг, U<br>М М9 Ω-                                    | 1 1       |                               | Mote: This start and F   | II- |
| W, Mo, Co   |           | In/gy 4500000 \ cocos-        | nous prepries entre shou | •   |
|   |           |                               |                          |     |

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/a

1:1:1 H2O / HF./ H2SO4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite Volentily), Oxide - Northere are repetation; and sociation; restore (Dissolved by heating in 1737 HZO / HF / HZSO4); Oxide - Northere history (~800EC) brooklie (fuse in Pt0 with KZSZO7); Ores (fuse in Pt0 with KZZZO7); Ores (fuse in Pt0 with provide it as plastic pigment and likely in brooktie (fuse in Pt0 with provide it as plastic pigment and likely in brooktie TI Containing Samples (Preparation and Solution) - Metal (Soluble in HZO / HF caution -powder reacts

HNO3 / LDPE container. 1-10,000 ppm single element solutions as the Ti(F)6-2 chemically stable for years in 2-5% HNO3 / trace HF in an LDPE container. with a fendency to hydrolyze forming the hydrated oxide in all dilute acids except HE.

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 ppm sincle element solutions as the Ti(F)8-2 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 transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming the hydrafed oxide in all dilute adds except HF. Chemical Compatibility - Soluble in concentrated HCI, HF, H3PO4 H2SO4 and HNO3. Avoid neutral to basic Atomic Weight, Valence; Coordination Number; Chemical Form in Solution - 47.87 +4 6 Ti(F)6-2

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

reported density. Do not pipette from the container. Do not refurn removed aliquots to container. - 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 renorded density. Do not bipette from the container. Do not return removed alticular to container.

Twitte sociate in the secied 101 beg, trainspleaded for the orderiver in the shalfy 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. - While stored in the sealed TCT bag, transpiration of this CRWRM is negligible. After opening the sealed TCT bag, transpiration in a negligible in the capture managed in the capture

- Store between approximately  $4^{\circ}$  - 30° C while in sealed TCT bag.

Page 4 of 4

Chairman / Senior Technical Director

- Sealed TCT Bag Open Date:

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

norganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.859.5790; 540.855.3030, Fax: 540.555.3012; Inorga - Reference Material Producer - Accredited / A2LA Certificate Number 883.02 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- This CRMRM 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 CRMRM being stored and handled in accordance with the instructions given in Sec. 7.1.

stability studies conducted on properly stored and handled CRWRMs. 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 CRMRM can be supported by long term

- The certification 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 CRWRM is damaged, confaminated, or otherwise modified.

Thomas Kozikowski Manager, Quality Control Certificate Approved By:

thibils Validity

- June 17, 2027 11.2 Lot Expiration Date

June 17, 2022 11.1 Certification Issue Date

Paul Gaines Certifying Officer:

0.Sr

0.11

CERTIFIED WEIGHT REPORT:

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



## Certified Reference Mater



| fied Refe   | rence Mai                     | fied Reference Material CRM | C |  | ANAB IS<br>AR-153<br>https://ab | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | dited |
|-------------|-------------------------------|-----------------------------|---|--|---------------------------------|--|-------|
| ¥           | Z #107                        | 7                           | 2 | 2/11/0   | <b>&gt;</b>                     |  |       |
| Solvent:    | Solvent: 24002546 Nitric Acid | Nitric Acid                 |   | A CONTRACTOR OF THE PARTY OF TH |                                 |  |       |
| 2%          | 40.0                          | Nitric Acid                 |   | Formulated By:   | Benson Chan                     | 031524   |       |
|             | (III)                         |                             |   | M  | Hento                           |  |       |
| Uncertainty |                               |                             |   | Reviewed By:   | Pedro L. Rentas                 | 031524   |       |

| Part Number:<br>Lot Number:                     |   | 19            |           | Solvei                           | Solvent: 24002546 Nitric Acid | 46 Nitr | ic Acid                              |          | A STATE OF THE STA | 1                                      |                  |        |
|---|---|---------------|-----------|----------------------------------|-------------------------------|---------|--------------------------------------|----------|--|--|------------------|--------|
| Description:                                    | Strontium (Sr)                              | (Sr)          |           | Q                                | 2% 40.0                       |         | Nitric Acid                          | , Itt    | Formulated Bv:   | Benson Chan                            | 8                | 031524 |
| Expiration Date:                                | 031527                                      |               |           |                                  |                               |         |                                      | L        | 7  | 1                                      |                  |        |
| Recommended Storage:                            | Ambient (20 °C)                             | (2)           |           |                                  |                               |         |                                      |          | 1  | A Company                              | 1                |        |
| Nominal Concentration (µg/mL):                  | 1000  |               |           |                                  |                               |         |                                      |          | June 1   | Kena                                   | ΄ Δ              |        |
| NIST Test Number:                               | 6UTB  |               | 5E-05 Ba  | 5E-05 Balance Uncertainty        | <u>~</u>                      |         |                                      | Œ        | Reviewed By:   | Pedro L. Rentas                        |                  | 031524 |
| Weight shown below was diluted to (mL); 2000.07 | as diluted to (mL):                         | 2000.07       | 0.100 Fla | 0.100 Flask Uncertainty          |                               |         |                                      | I        |  |  |                  |        |
|   |   |               |           |                                  |                               |         |                                      |          | Expanded   | SDS Information                        | mation           |        |
|   | Lot   | Nominal       | Purity U  | Nominal Purity Uncertainty Assay | say Target                    |         | Actual Act                           | Actual U | Uncertainty  | (Solvent Safety Info. On Attached pg.) | On Attached pg.) | TSIN   |
| Compound  | RM# Number Conc. (µg/mL) (%) Purity (%) (%) | Conc. (ug/mL) | (%)       | urity (%) (9                     | 6) Weight (g)                 |         | Weight (g) Conc. (µg/mL) +/- (µg/mL) | ug/mL) + | -/- (ug/mL) CAS#   | # OSHA PEL (TWA)                       | NA) LD50         | SRM    |

| 1. Strontium nitrate (Sr) |  | IN017 SRZ022018A1 | 1000                                    | 89.997   | 0.10  | 41.2 | 4.85470    | 4.85502 | 1000.1 | 2.0 | 10042-76-9 | NA                    | orl-rat >2000mg/kg 3153a |
|---------------------------|--|-------------------|---|----------|-------|------|------------|---------|--------|-----|------------|-----------------------|--------------------------|
| 5.0EG                     | [1] Spect  | [1] Spectrum No.1 | [ 14.495 sec]:58138.D# [Count] [Linear] | sec]:581 | 38.D# | Coun | nt] [Linea |         |        |     |            |                       |                          |
| 2.5E6                     |  |                   |   |          |       |      |            |         |        |     |            | -90-000 Market Market |                          |
| m/z->⊶<br>1.0E6           | •  | 10 20             |   | OG       | 0     |      | .00        | 09      | 0,     |     | 80         | . <u>0</u>            | 100                      |
| 5.0ES                     | unggap a militing di danggap kili. Ayaka sakair bi |                   |   |          |       |      |            |         |        |     |            |                       |                          |
| m/z-≫<br>5.0E6            |  | 110 120           |   | 130      | 041   |      | 150        | 160     | 0.71   |     | 180        | 081                   | 200                      |
| 2.5E6                     |  |                   |   |          |       |      |            |         |        |     |            |                       |                          |
| V-z/H                     | 4  | 220               |   | 230      | 240   | 14   | 250        | 260     |        |     |            |                       |                          |





Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

|         |                                      |               |               |           |                     | Ī  | Trace Me    | etals              | Verifica   | tion | by ICP-I  | ξS                  | (na/mr) |           |  |                   |                     |      |                          |
|---------|--------------------------------------|---------------|---------------|-----------|---------------------|--|-------------|--------------------|--|------|---|---------------------|---------|-----------|--|-------------------|---------------------|------|--------------------------|
| Name of | THE RESIDENCE OF THE PERSON NAMED IN | MARKET STATES | WITH STATE OF | Section 1 | Control of the last | Separate Sep | The Section | THE REAL PROPERTY. | Service Company of the Party of |      | Management of the last of the | Service of the last | в       | William . | The state of the s | <b>MANAGEMENT</b> | SHARWARD CONTRACTOR |      | The second second second |
| ₹       | <0.02                                | ਲ             | <0.02         | Dy        | <0.02               | HĘ   | <0.02       | E                  | <0.02  | Z    | <0.02   | Į.                  | L       | Se        | <0.2   | P                 | 4002                | B    | 2002                     |
| જ       | <0.02                                | రి            | <0.2          | 占         | <0.02               | Ho   | <0.02       | 7                  | <0.02  | ź    | <0.02   | Re                  | _       | S         | <0.02  | Ę                 | 2000                | =    | 7                        |
| As      | <0.2                                 | ඊ             | <0.02         | En        | <0.02               | 'n   | <0.02       | Mg                 | <0.01  | ő    | <0.02   | 招                   |         | Ag        | <0.02  | F                 | 2000                | >    |                          |
| Ba      | <0.02                                | ඊ             | <0.02         | 3         | <0.02               | 긔  | <0.02       | Mn                 | <0.02  | Pd   | <0.02   | Rb                  |         | ž         | 202  | É                 | 60 6                | 5    |                          |
| æ       | <0.01                                | ర             | <0.02         | త్        | <0.02               | 윤  | <0.2        | H                  | <0.2   | д    | <0.02   | Z.                  | 40.02   | 6         | !<br>-   | <u> </u>          | 20:05               | >    |                          |
| B.      | <0.02                                | රි            | <0.02         | පී        | <0.02               | 2  | <0.02       | Wo                 | <0.02  | ă    | <0.02   | S                   |         | v.        | , e  | 5                 | 600                 | , ,, |                          |
| В       | <0.02                                | ರೆ            | <0.02         | Au        | <0.02               | 2  | <0.02       | ğ                  | <0.02  | ×    | <0.2  | S                   | Ì       | Ta (      | <0.02  | Ē                 | 8.00<br>20.00       | 1 2  | 20:05                    |
|         |                                      |               |               |           |                     |  |             |                    |  |      |   |                     |         |           |  |                   |                     | 1    |                          |

(T) = Target analyte

## Physical Characterization:

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



Certified by:

1. P

Lot # 031524

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

<sup>\*</sup> 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.

<sup>\*</sup> 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).



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

### M5985 R:6/14/24

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:

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:

Indium

Starting Material:

Indium Metal

Starting Material Lot#:

2511

Starting Material Purity:

99.9995%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

 $10022 \pm 30 \mu g/mL$ 

Density:

1.044 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

Assay Method #1

10021 ± 56 µg/mL

ICP Assay NIST SRM 3124a Lot Number: 110516

Assay Method #2

10035 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

10001 ± 33 µg/mL

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>CRM/RM</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<sub>i</sub> = mean of Assay Method i with standard uncertainty uchar i

w<sub>i</sub> = the weighting factors for each method calculated using the inverse square of

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

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

k = coverage factor = 2

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{\frac{1}{2}}$  where  $u_{char}$  i are the errors from each characterization method

ubb = bottle to bottle homogeneity standard uncertainty

u<sub>lts</sub> = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Certified Value,  $X_{\text{CRM/RM}}$ , where one method of characterization is used is the mean of individual results:

Characterization of CRM/RM by One Method

 $X_{CRM/RM} = (X_n) (u_{char})$ 

X<sub>a</sub> = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k \left(u^2_{chara} + u^2_{bb} + u^2_{lts} + u^2_{ls}\right)^{1/2}$ 

k = coverage factor = 2

u<sub>char a</sub> = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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 | M | Se | < | 0.023000 | М | Zn | < | 0.006100 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| М | Al |   | 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 | M | Os | < | 0.000760 | 0 | Sr | < | 0.000610 |   |    |   |          |
| М | Ba | < | 0.001600 | M | Hf | < | 0.000760 | n | Р  | < |          | М | Ta | < | 0.000760 |   |    |   |          |
| 0 | Be | < | 0.000130 | M | Hg | < | 0.003100 | M | Pb |   | 0.001400 | М | Tb | < | 0.000760 |   |    |   |          |
| M | Bi | < | 0.000760 | М | Но | < | 0.000760 | М | Pd | < | 0.001600 | М | Te | < | 0.000760 |   |    |   |          |
| 0 | Ca |   | 0.004616 | 8 | In | < |          | М | Pr | < | 0.000760 | М | Th | < | 0.000760 |   |    |   |          |
| M | Cd | < | 0.000760 | М | lr | < | 0.000760 | M | Pt | < | 0.000760 | 0 | π  | < | 0.001100 |   |    |   |          |
| М | Ce | < | 0.000760 | 0 | K  |   | 0.007078 | М | Rb | < | 0.000760 | М | TI | < | 0.000760 |   |    |   |          |
| М | Co | < | 0.000760 | М | La | < | 0.000760 | М | Re | < | 0.000760 | М | Tm | < | 0.000760 |   |    |   |          |
| 0 | Сг | < | 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 | ٧  | < | 0.001600 |   |    |   |          |
| М | Cu | < | 0.003800 | 0 | Mg |   | 0.000707 | n | S  | < |          | М | W  | < | 0.001600 |   |    |   |          |
| М | Dy | < | 0.000760 | 0 | Mn |   | 0.000149 | M | Sb | < | 0.000760 | М | Υ  | < | 0.000760 |   |    |   |          |
| М | Er | < | 0.000760 | М | Мо | < | 0.002300 | М | Sc | < | 0.000760 | M | Yb | < | 0.000760 |   |    |   |          |
|   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |

n - Not Checked For s - Solution Standard Element

M - Checked by ICP-MS O - Checked by ICP-OES

i - Spectral Interference

### **INTENDED USE** 6.0

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> <a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. 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° 24° C to minimize the effects of transpiration. Use at 20° ± 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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 114.82 +3 6 In(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 HCl / HNO3); Oxide (Soluble in mineral acids); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in dilute HCl).

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 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 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

| 0 I TOT D 0          | na Datas |  |
|----------------------|----------|--|
| - Sealed TCT Bag Ope | en 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 20178hi



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com R: 2/22/2024 M5999 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:

CLPP-SPK-1

Lot Number:

T2-MEB721963

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

2 000 µg/mL ea:

Aluminum,

Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Manganese,

Nickel, Zinc,

Vanadium,

Cobalt,

250 μg/mL ea:

Copper,

200 µg/mL ea: Chromium,

50 μg/mL ea:

500.0 ± 2.2 μg/mL

Beryllium,

Silver

500.0 ± 2.2 µg/mL

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE** 2 000 ± 7 µg/mL 2 000 ± 9 µg/mL Aluminum, Al Barium, Ba Beryllium, Be 50.00 ± 0.26 µg/mL Chromium, Cr 200.0 ± 1.1 µg/mL 500.0 ± 2.4 µg/mL Cobalt, Co Copper, Cu 250.0 ± 1.0 µg/mL Iron, Fe 1 000 ± 4 µg/mL 500.0 ± 2.0 µg/mL Manganese, Mn Nickel, Ni 500.0 ± 2.2 µg/mL Silver, Ag 50.00 ± 0.22 µg/mL

Vanadium, V

Density:

1.070 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

Zinc, Zn

| ANALYTE | METHOD      | NIST SRM# | SRM LOT#     |
|---------|-------------|-----------|--------------|
| Ag      | ICP Assay   | 3151      | 160729       |
| Ag      | Volhard     | 999c      | 999c         |
| Ag      | Calculated  |           | See Sec. 4.2 |
| Al      | ICP Assay   | 3101a     | 140903       |
| Al      | EDTA        | 928       | 928          |
| Ba      | ICP Assay   | 3104a     | 140909       |
| Ba      | Gravimetric |           | See Sec. 4.2 |
| Be      | ICP Assay   | 3105a     | 090514       |
| Be      | Calculated  |           | See Sec. 4.2 |
| Co      | ICP Assay   | 3113      | 190630       |
| Co      | 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          |
| Mn      | ICP Assay   | 3132      | 050429       |
| Mn      | EDTA        | 928       | 928          |
| 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

Certified Value, X<sub>CRM/RM</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:

 $w_i = (1/u_{\mathrm{char}\,i})^2/(\Sigma(1/(u_{\mathrm{char}\,i})^2)$ 

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

k = coverage factor = 2

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$  where  $u_{char}$  are the errors from each characterization method

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 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<sub>CRM/RM</sub> = (X<sub>a</sub>) (u<sub>char a</sub>)

X<sub>a</sub> = mean of Assay Method A with

u<sub>char a</sub> = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (‡) =  $U_{CRM/RM} = k (u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{bs})^{1/2}$ 

k = coverage factor = 2

uchar a = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)
uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

- 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

- 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

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

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.689.6799; 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

July 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

- July 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** 

Paul R Line Chairman / Senior Technical Director

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

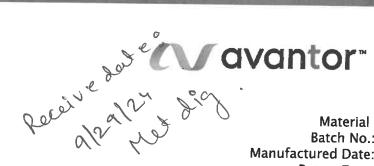


### R; 01/03/24 M6033 Certified Reference Material CRM

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

| m/z-> | 1.006 | 2.016 | m/z-> | N<br>O | 5.0E6 | m/z-> | 2.5E5 | 6-6 | 5.0E5                                 | Aluminum nitrate nonahydrate (Al) | Compound   | Weight shown below was diluted to (mL): | NIST Test Number:         | Nominal Concentration (µg/mL): | Recommended Storage: | Fyniret           | Des           | Fan Lot          | CERTIFIED WEIGHT REPORT: |
|-------|-------|-------|-------|--------|-------|-------|-------|-----|---------------------------------------|-----------------------------------|--|---|---------------------------|--------------------------------|----------------------|-------------------|---------------|------------------|--------------------------|
| 210   |       |       | 110   |        |       | 10    |       |     | [1] Spectrum No.1                     | 11                                | RM#  | below was dilut                         | Number:                   | (µg/mL):                       | Storage:             | Evniration Data:  | Description:  | Fart Number:     |                          |
| 220   |       |       | 120   |        |       | 20    |       |     | _                                     | IN022 ALM112021A1                 | Lot<br>Number Co   |   | 6UTB                      | 10000                          | Ambient (20 °C)      | 011636            | Aluminum (Al) | 011623           | )                        |
| 230   |       |       | 130   |        |       | 30    |       |     | 5.014 sec]:                           | 10000 99.999                      | Nominal Purity<br>Conc. (µg/mL) (%)                            | 2000.02 0.05                            | 5E-0                      |                                | <u>.</u>             |                   |               |                  |                          |
| 240   |       |       | 140   |        |       | 40    |       |     | 15.014 sec]:58113.D# [Count] [Linear] | 9 0.10 7.30                       | Purity Uncertainty Assay (%) Purity (%) (%)                    | 0.058 Flask Uncertainty                 | 5E-05 Balance Uncertainty |                                |                      | 2%                |               | Solvent:         | <b>&gt;</b>              |
| 250   |       |       | 150   |        |       | 50    |       |     | Count] [Line                          | 0 273.9779                        | ay Target<br>) Weight (g)                                      |   | <b>y</b>                  |                                | (1117)               |                   |               | it: 20510011     |                          |
| 260   |       |       | 160   |        |       | 60    |       |     | »ar]                                  | 274.0078 1                        | Actual<br>Weight (g) Con                                       |   |                           |                                |                      | Nitric Acid       |               | Nitric Acid      |                          |
|       |       |       | 170   |        |       | 70    |       |     |                                       | 10001.1 2                         | Actual Unce<br>Conc. (µg/mL) +/- (                             |   | Revi                      |                                |                      | Form              | 7             | ~e               | 7                        |
|       |       |       | 180   |        |       | 80    |       |     |                                       | 20.0 7784-27-2                    | Expanded (Si<br>Uncertainty (Si<br>+/- (µg/mL) CAS#            |   | Reviewed By:              | tach                           |                      | Formulated By:    | J.C. A. C. L. | L'internation of |                          |
|       |       |       | 190   |        |       | 90    |       |     |                                       | 2 mg/m3                           | SUS Information Support Safety Info. On Attacon OSHA PEL (TWA) |   | Pedro L. Rentas           | pena                           |                      | Giovanni Esposito | (             | 7                |                          |
|       |       |       | 200   |        |       | 100   |       |     |                                       |                                   | Attached   |   | 38                        | 8                              |                      | sito              |               | e de             |                          |
|       |       |       |       |        |       |       |       |     |                                       | orl-rat 3671 mg/kg 3101a          | pg.) NIST<br>LD50 SRM  |   | 011623                    |                                |                      | 011623            |               |                  |                          |

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 (PO <sub>4</sub> )              | ≤ 0.05 ppm    | < 0.03 ppm  |  |
| Sulfate (SO <sub>4</sub> )                | ≤ 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       |  |
| Heavy Metals (as Pb)                      | ≤ 100 ppb     | < 50 ppb    |  |

>>> Continued on page 2 >>>





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)                         | ≤ 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   |
| Frace Impurities – Zirconium (Zr)                      | ≤ 1.0 ppb     | < 0.1 ppb |

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



Nitric Acid 69% **CMOS** 

Receive: Avantor





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 (HNO <sub>3</sub> )         | 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 (PO <sub>4</sub> )      | ≤ 0.10 ppm    | < 0.03 ppm  |
| Sulfate (SO <sub>4</sub> )        | ≤ 0.2 ppm     | < 0.2 ppm   |
| Trace Impurities - Aluminum (AI)  | ≤ 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   | 1 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: Avantor





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 (HNO <sub>3</sub> )         | 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 (PO <sub>4</sub> )      | ≤ 0.10 ppm    | < 0.03 ppm  |
| Sulfate (SO <sub>4</sub> )        | ≤ 0.2 ppm     | < 0.2 ppm   |
| Trace Impurities - Aluminum (AI)  | ≤ 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   | 1 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

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





R->16/13/24 Met dig

M 6/21

Material No.: 9530-33 Batch No.: 0000275677 Manufactured Date: 2020/12/16 Retest Date: 2025/12/15

Revision No: 1

### 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       |  |  |
| 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       |  |  |
| ACS - Free Chlorine (as Cl2)              | <= 0.5 ppm    | < 0.5   |  |  |
| Phosphate (PO <sub>4</sub> )              | <= 0.05 ppm   | < 0.03  |  |  |
| Sulfate (SO <sub>4</sub> )                | <= 0.5 ppm    | < 0.3   |  |  |
| Sulfite (SO <sub>3</sub> )                | <= 0.8 ppm    | 0.3     |  |  |
| Ammonium (NH <sub>4</sub> )               | <= 3 ppm      | < 1     |  |  |
| Trace Impurities – Arsenic (As)           | <= 0.010 ppm  | < 0.003 |  |  |
| Trace Impurities - Aluminum (Al)          | <= 10.0 ppb   | < 0.2   |  |  |
| Arsenic and Antimony (as As)              | <= 5 ppb      | < 3     |  |  |
| Trace Impurities – Barium (Ba)            | <= 1.0 ppb    | < 0.2   |  |  |
| Trace Impurities – Beryllium (Be)         | <= 1.0 ppb    | < 0.2   |  |  |
| Trace Impurities – Bismuth (Bi)           | <= 10.0 ppb   | < 1.0   |  |  |
| Trace Impurities – Boron (B)              | <= 20.0 ppb   | < 5.0   |  |  |
| Frace Impurities – Cadmium (Cd)           | <= 1.0 ppb    | < 0.3   |  |  |
| Frace Impurities – Calcium (Ca)           | <= 50.0 ppb   | 29.7    |  |  |
| race Impurities – Chromium (Cr)           | <= 1.0 ppb    | < 0.4   |  |  |
| race Impurities – Cobalt (Co)             | <= 1.0 ppb    | < 0.4   |  |  |
| race Impurities – Copper (Cu)             | <= 1.0 ppb    | < 0.1   |  |  |
| race Impurities – Gallium (Ga)            | <= 1.0 ppb    | < 0.2   |  |  |

Material No.: 9530-33 Batch No.: 0000275677

| Test   | Specification | Result       |
|--|---------------|--------------|
| Trace Impurities - Germanium (Ge)                      | <= 3.0 ppb    | < 2.0        |
| Trace Impurities - Gold (Au)                           | <= 4.0 ppb    | < 0.2        |
| Heavy Metals (as Pb)                                   | <= 100 ppb    | < 50         |
| Trace Impurities – Iron (Fe)                           | <= 15.0 ppb   | <1           |
| Trace Impurities – Lead (Pb)                           | <= 1.0 ppb    | < 0.5        |
| Trace Impurities – Lithium (Li)                        | <= 1.0 ppb    | 0.2          |
| Trace Impurities – Magnesium (Mg)                      | <= 10.0 ppb   | 0.4          |
| Trace Impurities – Manganese (Mn)                      | <= 1.0 ppb    | < 0.4        |
| Trace Impurities – Mercury (Hg)                        | <= 0.5 ppb    | 0.1          |
| Trace Impurities – Molybdenum (Mo)                     | <= 10.0 ppb   | < 5.0        |
| Trace Impurities – Nickel (Ni)                         | <= 4.0 ppb    | < 0.3        |
| Trace Impurities – Niobium (Nb)                        | <= 1.0 ppb    | < 0.2        |
| Frace Impurities – Potassium (K)                       | <= 9.0 ppb    | < 2.0        |
| Frace Impurities - Selenium (Se), For Information Only | ppb           | 1.0          |
| Trace Impurities - Silicon (Si)                        | <= 100.0 ppb  | < 10.0       |
| race Impurities – Silver (Ag)                          | <= 1.0 ppb    | < 0.3        |
| race Impurities – Sodium (Na)                          | <= 100.0 ppb  | < 5.0        |
| race Impurities – Strontium (Sr)                       | <= 1.0 ppb    | < 0.2        |
| race Impurities – Tantalum (Ta)                        | <= 1.0 ppb    | < 0.9        |
| race Impurities – Thallium (TI)                        | <= 5.0 ppb    | < 2.0        |
| race Impurities – Tin (Sn)                             | <= 5.0 ppb    | < 0.8        |
| race Impurities - Titanium (Ti)                        | <= 1.0 ppb    | 0.8          |
| race Impurities – Vanadium (V)                         | <= 1.0 ppb    | < 0.2        |
| race Impurities – Zinc (Zn)                            | <= 5.0 ppb    |              |
| race Impurities – Zirconium (Zr)                       | <= 1.0 ppb    | 0.3<br>< 0.1 |

For Laboratory, Research or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications

Country of Origin:

US

Packaging Site:

Phillipsburg Mfg Ctr & DC



M6125 Receive -> 11/22/24

### **CORCO CHEMICAL CORPORATION**

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

Office and Plant 299 Cedar Lane Fairless Hills, PA 19030

Phone: 215-295-5006 Fax: 215-295-0781

### Hydrogen Peroxide 30%, ACS Reagent Grade

| SPECIFICATION               | MAXIMUM LIMITS                                       |
|-----------------------------|--|
| Appearance                  | Colorless and free from suspended matter or sediment |
| Assay                       | 29-32%   |
| Color (APHA)                | 10   |
| Residue after Evaporation   | 0.002%   |
| Titratable Acid             | 0.0006 meq/g   |
| Chloride (CI)               | 3 ppm  |
| Nitrate (NO <sub>3</sub> )  | 2 ppm  |
| Phosphate                   | 2 ppm  |
| Sulfate (SO <sub>4</sub> )  | 5 ppm  |
| Ammonium (NH <sub>4</sub> ) | 5 ppm  |
| Heavy Metals (as Pb)        | 1 ppm  |
| Iron (Fe)                   | 0.5 ppm  |







R -> 11/12/24

Material No.: 9606-03 Batch No.: 24D1062002

Manufactured Date: 2024-03-26

Retest Date: 2029-03-25

Revision No.: 0

### Certificate of Analysis

| Test                              | Specification | Result      |
|-----------------------------------|---------------|-------------|
| Assay (HNO3)                      | 69.0 – 70.0 % | 69.7 %      |
| Appearance                        | Passes Test   | Passes Test |
| Color (APHA)                      | ≤ 10          | 5           |
| Residue after Ignition            | ≤ 2 ppm       | 1 ppm       |
| Chloride (CI)                     | ≤ 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 (AI)  | ≤ 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    | 2.3 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     | 100 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 >>>

Nitric Acid 69% CMOS





Material No.: 9606-03 Batch No.: 24D1062002

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Cloak

Director Quality Operations, Bioscience Production

### 800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

58111 122223

Sodium (Na)

Lot Number: Description:

Nominal Concentration (µg/mL):

**NIST Test Number:** 

**6UTB** 10000

Weight shown below was diluted to (mL):

3000.4

0.06 Flask Uncertainty 5E-05 Balance Uncertainty

RW#

Number Lot

Nominal

Purity

Uncertainty Assay Purity (%)

Target

Actual

8

38

Recommended Storage:

Ambient (20 °C)

122226

**Expiration Date:** 

Lot # M5807

Solvent:

24002546 Nitric Acid

2%

60.0 (III)

Nitric Acid

Formulated By: 13817 P Aleah O'Brady Back

Reviewed By: Pedro L. Rentas

122223

22223

Actual Uncertainty Expanded (Solvent Safety Info. On Attached pg.) **SDS Information** TSIN

CAS#

SE

1. Sodium nitrate (Na) IN036 NAV01201511 Conc. (µg/mL) 10000 98.999 0.10 26.9 111.5406 Weight (g) Weight (g) Conc. (µg/mL) 111.5479 10000.7 +/- (µg/mL) 20.0 7631-99-4 OSHA PEL (TWA) 5 mg/m3 ori-rat 3430 mg/kg 3152a

1 m/z-> 17/z-Y m/z-> N.5E6 5.0E6 2.5E6 5.0E6 2.5E5 5.0E5 [1] Spectrum No.1 210 110 0 220 120 NO. [ 8.935 sec]:58111.D# [Count] [Linear] 130 230 30 140 240 6 150 250 50 160 260 0 170 70 180 80 190 90 100 200

Part # 58111



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

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

|                    | As Ba Ba Ba  |          |
|--------------------|--|----------|
|                    | 40.2<br>40.2<br>40.2<br>40.0<br>40.0<br>40.0<br>40.0<br>40.0   |          |
|                    | 585855   |          |
|                    | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02   |          |
|                    | 돌 유 교 교 및 및 및 및 및 및 및 및 및 및 및 및 및 및 및 및 및  |          |
|                    | 4422   |          |
|                    | 27. 24 年 27. 24. 24. 24. 24. 24. 24. 24. 24. 24. 24  |          |
|                    | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4  | Trace M  |
|                    | Mo Mg Lu   | fetals   |
| (T) = Tar          | 442<br>442<br>442<br>442<br>442<br>442<br>442<br>442<br>442<br>442   | Verifica |
| ) = Target analyte | N N O B o K N  | ation    |
| ılytе              | 4000<br>4000<br>4000<br>4000<br>4000<br>4000   | by ICP-  |
|                    | S R R R R  | NO C     |
|                    | 400000000000000000000000000000000000000  | (m/)     |
|                    | T <sub>a</sub> S <sub>7</sub> S <sub>8</sub>   |          |
|                    | 402<br>402<br>402<br>402<br>402  |          |
|                    | in Signal in the | ı        |
|                    | 40.02<br>40.02<br>40.02<br>40.02   |          |
|                    | * * * * * * * * * * * * * * * * * * *  |          |
|                    | 600000000000000000000000000000000000000  |          |

## 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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\* 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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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: 57051 120523 BTU9 1000 120526 Ambient (20 °C) Antimony (Sb) 3000.41 0.058 5E-05 Flask Uncertainty Balance Uncertainty 24002546 Lot # 2.0% M.5802 Nitric Acid Solvent: 0.00 MSBOS Nitric Acid Formulated By: Reviewed By: Pedro L. Rentas Lawrence Barry 120523 120523

1. Antimony (Sb)

58151

100923

0.1000

300.0

1000

10001.4

1000.0

7440-36-0

0.5 mg/m3

orl-rat 7000 mg/kg 3102a

Number Part

Number Ď

Vol. (ml.)

Pipette (ml.) Conc. (µg/ml.)

Conc. (µg/mL)

Conc. (µg/ml.)

+/- (µg/mt.) Uncertainty Expanded

CAS#

(Solvent Safety Info. On Attached pg.) OSHA PEL (TWA)

LD50

SRM NIST SDS Information

Final

Dilution Factor

Initial

Uncertainty

Nominal

Compound

| -2/m   | 1.057 | m/z-><br>2.0E7 | 2.<br>6<br>8 | 5.0E5  | 2.0<br>E | 6.OE6 |
|--------|-------|----------------|--------------|--|----------|-------|
|        |       |                |              | to describe the second  |          |       |
| 210    |       | 10             |              | ō  |          |       |
| 220    |       | ±              |              | N  |          |       |
| 0      |       | N              |              | N  |          |       |
| 230    |       | 130            |              | 30   |          |       |
| 240    |       | .d.            |              |  |          |       |
|        |       | 140            |              | ò  |          |       |
| 0      |       | 180            |              | 50   |          |       |
| N<br>O |       |                |              |  |          |       |
| 0      |       | 180            |              | 9  |          |       |
|        |       | 170            |              | 70   |          |       |
|        |       | 180            |              | <b>8</b>   |          |       |
|        |       | 190            |              | 8  |          |       |
|        |       |                |              | Constitution or section of the control of the contr |          |       |
|        |       | 200            |              | 100  |          |       |

Part # 57051



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

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

|                     | -     | Г            | -              |       |              |               |        | _           |              |            |       |                         | II           | ľ         | -    |   |
|---------------------|-------|--------------|----------------|-------|--------------|---------------|--------|-------------|--------------|------------|-------|-------------------------|--------------|-----------|------|---|
|                     |       | 9            | 9              | _     | 8            |               | 200    | 8           | <u></u>      | 9          | -     | 2                       | ı            | I         |      |   |
|                     |       | 70.0>        | 2 1            | 200   | 10.05        |               | 200    | 6           | 3            | -          |       | 8                       |              |           |      |   |
|                     |       | 2            | 2 8            | 3     | ζ.           | 9             | ر<br>ا | ξ           | 2            | ದಿ         |       | 2                       |              | l         |      |   |
|                     |       | 20.02        | 600            | 3     | <u>8</u>     | 400           | 3      | 70.05       | 3            | 8          | -     | 40.02                   |              |           |      |   |
|                     | Ī     | Aμ           | . Ç            | 9     | වී           | ٤             | 5      | E E         | 1            | Į,         | 1     | Ž                       | Target State |           |      |   |
|                     |       | <b>∆</b> 022 | 70.02          | 3     | <b>∆</b> 002 | 2000          | 3      | 20.02       |              | _<br>∆0,02 | 2000  | 2002                    |              |           |      |   |
|                     |       | 3            | 2              | 1     | ď,           | =             | 7      | 5           | 1            | H          | 111   | HF.                     |              |           |      |   |
|                     |       | <b>₽</b>     | 20.02          | 3     | <u> </u>     | 20.02         | 3      | A.03        | -            | 200        | 2000  | 400                     |              | FI ace Iv | 7300 |   |
|                     |       | Z            | Mo             |       | T.           | MD            |        | Z           | l s          | =          | _     |                         |              | SECON     | +2   | I |
| (T) = Tamet analyte |       | 40.00        | 20.02          |       | <u>A</u>     | 40.02         |        | <u>0</u> 01 | 4000         | 3          | 20.02 | 200                     |              | ACHILLA   |      |   |
|                     | Ŀ     | ~            | 7              |       | Ð            | Pd            | !      | ဂ္ဂ         | M            | Z          | 2     |                         |              | COL       | )    |   |
| akao                | 20.6  | 3            | 40,02          | 40.00 | 3            | A0.02         |        | 2002        | 20.00        | 3          | 20.02 |                         |              | DY ICP-N  |      |   |
|                     | Ę     | ç            | Si             | M     | <b>B</b>     | 25            |        | 굣           | 700          | 9          | 7     |                         |              | S         | 10   |   |
|                     | 20.02 | 3            | 20.02          | 20.02 | 3            | <b>∆</b> 0,02 | 40.04  | 3           | 20.02        | 3          | 8     |                         |              | g/mL)     |      |   |
|                     | Ē     | 3            | S              | IC    | 2            | Z             | 26     | A           | 2            | ?          | Š     |                         | ı            |           |      | ı |
|                     | 20.05 | 3            | <b>40.0</b> 2  | 70.0> | 3            | <u>A</u>      | 20.02  | 3           | 20.02        |            | 02    | Section Control Control |              |           |      |   |
|                     | E     | 3 1          | S              | I     | 1            | <b>=</b>      | 11     | 3           | ie.          | į          | J     |                         |              |           |      |   |
|                     | 20.02 | 0.00         | A 62           | 40.02 |              | A 83          | 20.02  | 3           | <b>∆0.02</b> | -          | 900   |                         |              |           |      |   |
|                     | 177   | 1            | 7 <sub>n</sub> | 7     | : ;          | ş             | _      | 4           | 9            |            | W     | Company                 |              |           |      |   |
|                     | 40.02 | 10.01        | 3              | 80.02 | 20.04        | 3             | 20.02  | 3           | 80.02        | 20.04      | 2000  |                         |              |           |      |   |

(1) = 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 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.

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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).

Printed: 1/16/2024, 3:48:48 PM

Part # 57051

Lot # 120523

Certified Reference Material CRM

M6030



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

R = 8 | 5 | 24

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CERTIFIED WEIGHT REPORT:

800-368-1131

Absolute Standards, Inc.

Part Number: Solvent: 24002546 Lot # Nitric Acid

Lot Number: Description: 57047 122823 Silver (Ag)

Recommended Storage: **Expiration Date:** 1000 122826

Weight shown below was diluted to (mL): 4000.30

1. Silver nitrate (Ag)

IN035 J0612AGA1

1000.0

0.10

63.7

6.27992

6.27998

1000.0

2.0

7761-88-B

10 ug/m3

Z

3151

Nominal Concentration (µg/mL): NIST Test Number: **6UTB** Ambient (20 °C) 0.058 Flask Uncertainty 5E-05 Balance Uncertainty

2% <u>E</u> 80.0 Nitric Acid

Formulated By:

Benson Chan

122823

122823

Reviewed By: Pedro L. Rentas

Compound RM# Number 헏 Conc. (µg/mL) Nominal Purity Uncertainty Assay 8 Purity (%) 38 Weight (g) Target Weight (g) Conc. (µg/mL) Actual Actual +/- (µg/mL) Uncertainty Expanded CAS# (Solvent Safety Info. On Attached pg.) SDS Information NIST SRM

m/z-> m/z-> W-2/m 5.0E6 5.0E5 1.0≡6 2.5E6 5.0E6 1.0€7 [1] Spectrum No.1 210 110 0 120 NNO NO [ 14.044 sec]:58147.D# [Count] [Linear] 230 130 30 140 240 ò 150 250 50 260 160 00 170 0 180 0 190 000 200 100

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|     |                  |                 |       |    |       |    | race Me        | letals | Verificat | tion | by ICP-I     | S         | $\mu$ g/mL)   |    |              |   |               |    |        |
|-----|------------------|-----------------|-------|----|-------|----|----------------|--------|-----------|------|--------------|-----------|---------------|----|--------------|---|---------------|----|--------|
| No. | Will Will Street |                 |       |    |       |    | The No. of the |        |           |      |              |           |               |    |              |   |               |    |        |
| Ą   | <0.02            | ${\mathfrak L}$ | <0.02 | Dy | <0.02 | H  | <0.02          | Ľ      | <0.02     | Z    | <0.02        | 7         | <0.02         | Se | 40.2         | 귱 | <0.02         | W  | <0.02  |
| Sb. | <0.02            | င္က             | 40.2  | 咭  | 40.02 | Но | <0.02          | Ľ.     | <0.02     | 3    | 40.02        | Re        | <b>∆</b> 0.02 | S: | <b>6</b> .02 | 근 | <b>∆</b> .02  | ┙  | 40.02  |
| As  | 40.2             | င္စ             | <0.02 | 땰  | 40.02 | 'n | <0.02          | Mg     | <0.01     | တ္တ  | 40.02        | Rh.       | <0.02         | Ag | 1            | ∄ | <b>∆</b> 0.02 | <  | <0.02  |
| Ва  | <0.02            | రి              | 40,02 | 8  | <0.02 | 듁  | 40.02          | Mn     | 40.02     | Pd   | <0.02        | <b>25</b> | 40.02         | Z  | <b>4</b> 0.2 | ∄ | <u>\$</u>     | ₩  | <0.02  |
| Ве  | 40.01            | Ω               | <0.02 | හු | <0.02 | ਲ  | 40.2           | Hg     | 40.2      | P    | 40.02        | Ru        | <b>∆</b> 0.02 | Ş, | A0.02        | Ħ | <0.02         | Κ. | <0.02  |
| ₿.  | <0.02            | င္ပ             | <0.02 | ႙ၟ | <0.02 | 2  | <0.02          | Mo     | <0.02     | 77   | <b>∆</b> .02 | Sm        | 40.02         | Ś  | 40.02        | S | A).02         | Zn | A) ()2 |
| В   | <0.02            | Cî              | <0.02 | Au | <0.02 | РЬ | <0.02          | Z      | <0.02     | ×    | 40.2         | ç         | 40.02         | 교  | <0.02        | Ħ | 40.02         | 72 | <0.02  |

Physical Characterization:

(T)= Target analyte

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.
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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).

## Absolute Standards, Inc. 800-368-1131

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## Certified Reference Material CRM

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

R: 03/16/23 MS473 MS474, MS475, MS Lot #

CERTIFIED WEIGHT REPORT:

Part Number:

56138 082922

Solvent: 20510011

Nitric Acid

2% 20.0 Nitric Acid

<u>P</u>

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000 Recommended Storage:

Ambient (20 °C) 082925

**Expiration Date:** 

Description: Lot Number:

Strontium (Sr)

Weight shown below was diluted to (mL):

1000.12

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/mL) +/- (µg/mL)

Uncertainty

Expanded

닭

Nominal

Purity Uncertainty Assay

Formulated By: Lawrence Barry

Pedro L. Rentas

Reviewed By:

082922

082922

CAS#

SDS Information
(Solvent Safety Info. On Attached pg.) OSHA PEL (TWA)

LD50

SRM SRM

Strontium nitrate (Sr 5.0E6 [1] Spectrum No.1 IN017 SRZ022018A1 [ 14.495 sec]:58138.D# [Count] [Linear] 10000 99.997 0.10 41.2 24.2756 24.2758 10000.1 20.0 10042-76-9 Ι₹ orl-rat >2000mg/kg 3153a

M/z-> 5.0E5 1.0E6 2.5 € 6 10

20

30

40

50

60

0

80

90

100

Lot # 082922

m/z->

210

220

230

240

250

260

2.5E6

m/z->

110

120

130

140

150

160

170

190

200

5.0E6

Part # 56138

1 of 2

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

| П  |       |                 |       | П   |       | Ш  | Trace Me | tals | Verifica | tion       | by ICP- | S      | μg/mL) | Н              |       |    |           |          |       |
|----|-------|-----------------|-------|-----|-------|----|----------|------|----------|------------|---------|--------|--------|----------------|-------|----|-----------|----------|-------|
|    |       |                 |       | I   |       | i  |          |      |          | ı          | 8       | ı      |        | ۱              |       |    |           |          |       |
| A  | <0.02 | ${\mathfrak S}$ | <0.02 | Dу  | <0.02 | H  | <0.02    | Ľ.   | 40.02    | <u>Z</u> . | <0.02   | P.     | <0.02  | Se             | <0.2  | 4T | <0.02     | ¥        | <0.02 |
| SЬ | <0.02 | က္အ             | <0.2  | 缸   | △0.02 | Но | <0.02    | Lu   | <0.02    | 子          | <0.02   | Re     | <0.02  | Si             | <0.02 | Te | ∆<br>0.02 | Ϥ        | <0.02 |
| As | <0.2  | ප               | <0.02 | 땹   | <0.02 | F  | <0.02    | Mg   | <0.01    | ္တ         | <0.02   | ₽      | <0.02  | Ag             | <0.02 | ∄  | <0.02     | <        | <0.02 |
| Ва | <0.02 | స               | <0.02 | ନ୍ଦ | <0.02 | ī  | <0.02    | M    | <0.02    | Pd         | <0.02   | ₽<br>B | <0.02  | N <sub>2</sub> | <0.2  | ∄  | <0.02     | 4        | <0.02 |
| Be | <0.01 | <del>Ω</del>    | △0.02 | ନ୍ଥ | <0.02 | 듔  | <0.2     | Нg   | <0.2     | Р          | <0.02   | ᇟ      | <0.02  | Sr             | Ţ     | Tm | <0.02     | <b>~</b> | <0.02 |
| Bi | 40.02 | င္ပ             | <0.02 | Ge  | <0.02 | La | <0.02    | Μo   | <0.02    | 뫈          | <0.02   | Sm     | <0.02  | S              | <0.02 | Sn | <0.02     | Zn       | <0.02 |
| В  | <0.02 | ₽<br>C          | <0.02 | Au  | <0.02 | Рь | <0.02    | Nd   | 40.02    | ×          | <0.2    | Sc     | <0.02  | Ta             | <0.02 | ∄  | <0.02     | Zr       | <0.02 |
|    |       |                 |       |     |       |    |          |      |          |            |         |        |        |                |       |    |           |          |       |

Physical Characterization:

(T)= Target analyte

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Part # 56138

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## Certified Reference Material CRM

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

R: 03/16/23 MS473 MS474, MS475, MS Lot #

CERTIFIED WEIGHT REPORT:

Part Number:

56138 082922

Solvent: 20510011

Nitric Acid

2% 20.0 Nitric Acid

<u>P</u>

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000 Recommended Storage:

Ambient (20 °C) 082925

**Expiration Date:** 

Description: Lot Number:

Strontium (Sr)

Weight shown below was diluted to (mL):

1000.12

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> Formulated By: Lawrence Barry

Pedro L. Rentas

Reviewed By:

082922

082922

SDS Information
(Solvent Safety Info. On Attached pg.) OSHA PEL (TWA)

LD50

SRM SRM

10042-76-9 Ι₹ orl-rat >2000mg/kg 3153a

Strontium nitrate (Sr

IN017 SRZ022018A1

10000

99.997

0.10

41.2

24.2756 Weight (g)

24.2758

10000.1

20.0

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g) Conc. (µg/mL) +/- (µg/mL)

CAS#

Uncertainty

Expanded

닭

Nominal

Purity Uncertainty Assay

m/z-> m/z-> M/z-> 2.5E6 5.0E6 5.0E5 1.0E6 2.5 € 6 5.0E6 [1] Spectrum No.1 210 110 10 220 120 20 [ 14.495 sec]:58138.D# [Count] [Linear] 230 130 30 140 240 40 250 150 50 260 160 60 170 0 80 190 90 200 100

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

| П  |       |                 |       | П   |       | Ш  | Trace Me | tals | Verifica | tion       | by ICP- | S      | μg/mL) | Н              |       |    |           |          |       |
|----|-------|-----------------|-------|-----|-------|----|----------|------|----------|------------|---------|--------|--------|----------------|-------|----|-----------|----------|-------|
|    |       |                 |       | I   |       | i  |          |      |          | ı          | 8       | ı      |        | ۱              |       |    |           |          |       |
| A  | <0.02 | ${\mathfrak S}$ | <0.02 | Dу  | <0.02 | H  | <0.02    | Ľ.   | 40.02    | <u>Z</u> . | <0.02   | P.     | <0.02  | Se             | <0.2  | 4T | <0.02     | ¥        | <0.02 |
| SЬ | <0.02 | က္အ             | <0.2  | 缸   | △0.02 | Но | <0.02    | Lu   | <0.02    | 子          | <0.02   | Re     | <0.02  | Si             | <0.02 | Te | ∆<br>0.02 | Ϥ        | <0.02 |
| As | <0.2  | ප               | <0.02 | 땹   | <0.02 | F  | <0.02    | Mg   | <0.01    | ္တ         | <0.02   | ₽      | <0.02  | Ag             | <0.02 | ∄  | <0.02     | <        | <0.02 |
| Ва | <0.02 | స               | <0.02 | ନ୍ଦ | <0.02 | ī  | <0.02    | M    | <0.02    | Pd         | <0.02   | ₽<br>B | <0.02  | N <sub>2</sub> | <0.2  | ∄  | <0.02     | 4        | <0.02 |
| Be | <0.01 | <del>Ω</del>    | △0.02 | ନ୍ଥ | <0.02 | 듔  | <0.2     | Нg   | <0.2     | Р          | <0.02   | ᇟ      | <0.02  | Sr             | Ţ     | Tm | <0.02     | <b>~</b> | <0.02 |
| Bi | 40.02 | င္ပ             | <0.02 | Ge  | <0.02 | La | <0.02    | Μo   | <0.02    | 뫈          | <0.02   | Sm     | <0.02  | S              | <0.02 | Sn | <0.02     | Zn       | <0.02 |
| В  | <0.02 | ₽<br>C          | <0.02 | Au  | <0.02 | Рь | <0.02    | Nd   | 40.02    | ×          | <0.2    | Sc     | <0.02  | Ta             | <0.02 | ∄  | <0.02     | Zr       | <0.02 |
|    |       |                 |       |     |       |    |          |      |          |            |         |        |        |                |       |    |           |          |       |

Physical Characterization:

(T)= Target analyte

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).

Part # 56138

## Absolute Standards, Inc. 800-368-1131

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## Certified Reference Material CRM

M6023

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

|  |                 | Weight shown below was diluted to (mL): | NIST Test Number:         | Nominal Concentration (µg/mL): | Recommended Storage: | Expiration Date: |                | Description:  | Lot Number:    | Part Number:      | CERTIFIED WEIGHT REPORT: |
|--|-----------------|---|---------------------------|--------------------------------|----------------------|------------------|----------------|---------------|----------------|-------------------|--------------------------|
| Lot                                    |                 | ted to (mL):                            | 8TUB                      | 1000                           | Ambient (20 °C)      | 062727           |                | Thalllum (TI) | 062724         | 57081             |                          |
| Nominal                                |                 | 2000.1                                  |                           |                                | ၀<br>(၄)             |                  |                |               |                |                   |                          |
| Purity Uncertainty Assay               |                 | 0.10 Flask Uncertainty                  | 5E-05 Balance Uncertainty |                                |                      |                  | 2%             |               |                | Solvent:          |                          |
| Target                                 |                 |   |                           |                                |                      | (mL)             | 40.0           |               |                | Solvent: 24002546 | Lot #                    |
| Actual                                 |                 |   |                           |                                |                      |                  | Nitric Acid    |               |                | Nitric Acid       |                          |
| Actual                                 |                 |   |                           |                                |                      |                  |                |               |                |                   |                          |
| Uncertainty                            | Expanded        |   | Reviewed By:              | Juna                           | 1                    |                  | Formulated By: | 4             | TO ST          | >                 |                          |
| (Solvent Safety Info. On Attached pg.) | SDS Information |   | Pedro L. Rentas           | " human                        | A A                  |                  | Aleah O'Brady  | 0             | San O To asign | 7                 |                          |
| ched pg.) NIST                         |                 |   | 062724                    |                                |                      |                  | 062724         |               |                | ,                 |                          |
| 7                                      |                 |   |                           |                                |                      |                  |                |               |                |                   |                          |

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM

| ~-Z/III | 5.0E5 | 1.0E6 | m/z->    | 5000 | 1.0€4    | 1.0E6 | 2.OE6                                   |  |
|---------|-------|-------|----------|------|----------|-------|---|--|
| N       |       |       | -1       |      |          |       | El opegrum No.                          |  |
| 210     |       |       | 10       |      | ö        |       | 3                                       |  |
| 220     |       |       | 120      |      | N O      |       |   |  |
|         |       |       |          |      |          |       | 4<br>0                                  |  |
| 230     |       |       | 130      |      | <b>9</b> |       | [ ]4.044 sec]:57081.D# [Count] [Linear] |  |
| 240     |       |       | <u> </u> |      | 4        |       | 57081.                                  |  |
| ō       |       |       | 140      |      | 40       |       | <u> </u>                                |  |
| 250     |       |       | <b>1</b> |      | OI.      |       |   |  |
|         |       |       |          |      |          |       | 000000000000000000000000000000000000000 |  |
| 0       |       |       | 160      |      | 60       |       |   |  |
|         |       |       | 4        |      | 70       |       |   |  |
|         |       |       | 170      |      | 0        |       |   |  |
|         |       |       | 180      |      | 80       |       |   | 100  |
|         |       |       |          |      |          |       |   |  |
|         |       |       | 190      |      | 90       |       |   | or any   |
|         |       |       | 200      |      | 100      |       |   |  |
|         |       |       | ŏ        |      | ŏ        |       |   | See all see al |
|         |       |       |          |      |          |       |   | 0  |

Part # 57081



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

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

|                      |       | ᄧ        | 10            | Ħ.            | Ве           | , to  | ಸ<br>ತ       | AS            |               | Sb       |              | <u>&gt;</u>  |                  | Ī         |       |  |
|----------------------|-------|----------|---------------|---------------|--------------|-------|--------------|---------------|---------------|----------|--------------|--|------------------|-----------|-------|--|
|                      |       | 40.02    | 20.02         | 3             | <u>6</u> .01 | 70.02 | 3            | 4.6           | 5             | <u> </u> |              | A) 02  |                  |           |       |  |
|                      | ŀ     | ဂ္       | 8             | )             | ç            | Ç     | ,            | g             | <u> </u>      | ري<br>و  | -            | 2  |                  | l         |       |  |
|                      |       | 40.02    | 20.02         |               | A).03        | 20.03 | 3            | 40.02         |               | <u>ه</u> | 10.01        | 20.02  |                  |           |       |  |
|                      |       | A        | G<br>G        | 9             | <u>.</u>     | Ga    | 2            | E E           | 1 1           | Į        | 5            | 7  | A PROPERTY OF    |           |       |  |
|                      | 20,02 | 3        | 40.02         | 0.01          | 3            | 20.02 | 3            | <b>∆</b> 0.02 |               | 200      | 10.04        | 2000   | CATALOGUE SANCES |           |       |  |
|                      | 100   | ğ        | Į,            | ,             | <u>.</u>     | Ę     | •            | ď             | 110           | ᄪ        | 121          | 321  |                  |           | _     |  |
|                      | 70.02 | 3        | <b>∆</b> 0.02 | ć             | 2            | 40.02 |              | <b>∆</b> .02  | 20.02         | 3        | 20.02        | 200  |                  | ומכפ ויונ | TOO M |  |
|                      |       | Ž        | Mo            | 21.1          | Ę            | M     | q            | Mg            | 100           | T :      | E            |  |                  | cais      | 7     |  |
| (T) = Target analyte | 20.02 | 3        | &<br>20.02    | 7.0           | 5            | 40.02 |              | <u>A</u>      | 20.02         | 3        | 20.02        | 200  |                  | ACHILLA   | くのがない |  |
| et anal              | F     | 4 .      | 7             | 7             | ,            | Pd    | Ş            | ခွ            | IND           | ź        | 2            |  | 8                | ונוטוו    | ÷.    |  |
| yte                  | 2.05  | <b>b</b> | <u>\$</u>     | 20,02         | Š            | <0.02 | 10,02        | 3             | 20.02         | 3        | <0.02        |  |                  | Dy ICE-   | 3     |  |
|                      | Sc    | ,        | S E           | X.            | ,            | 2     | 1            | P.            | Ke            | ;        | 7            |  |                  | WU C      | 20    |  |
|                      | 40.02 | 20:02    | 3             | 40.02         |              | <0.02 | 10.04        | 3             | 20.02         | 2        | <u>&amp;</u> |  |                  | ug/mL)    |       |  |
|                      | Ta    | ,        | <i>n</i>      | Si            |              | Z     | 3            | <u> </u>      | S             | ?        | ဇ္ဇ          |  | I                |           |       |  |
|                      | 40,02 | 40.04    | 3             | A).02         | i            | 40.2  | 20.03        | 3             | <b>∆</b> 0.02 | · i      | A).2         |  |                  |           |       |  |
|                      | 11    | 011      | ?             | ď             | ŀ            | #     | 1.1          | 1             | Te            |          | 7            |  |                  |           |       |  |
|                      | 40.02 | 70.02    | 3             | 40.02         | 40.04        | AD 03 | _            | 3             | <u>6</u> ,02  | 60.00    | <0.03        |  |                  |           |       |  |
|                      | Zr    | 112      | 7             | ×             | ć            | ş     | <            | ă<br>Y        | _<br>_        |          | W.           | Talenta Commission   |                  |           |       |  |
|                      | 40.02 | 20.02    | 3             | <b>∆</b> 0.02 | 70.02        | 3     | <b>∆</b> .02 |               | A 0.02        | 20.02    | 28           | TOTAL CONTRACTOR AND ADDRESS OF THE PARTY OF |                  |           |       |  |

## 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).

### 800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



## Certified Reference Material CRM

M6021

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

CERTIFIED WEIGHT REPORT Part Number: Lot Number: 57023 062424 24002546 Nitric Acid Solvent:

Nitric Acid

Ambient (20 °C) 2.0% (III) 40.0

Formulated By:

Aleah O'Brady

062424

ASSET O DE LONG

Recommended Storage:

**Expiration Date:** 

062427

Description:

Vanadium (V)

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): NIST Test Number: **6UTB** 1000 2000.3 5E-05 0.06 Balance Uncertainty Flask Uncertainty Reviewed By:

Pedro L. Rentas

062424

Ammonium metavanadate (V) Compound 58123 Number Part 021224 Number ρţ 0.1000 Dilution Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) 200.0 Initial Uncertainty 0.084 Nominal 1000 Conc. (µg/mL) Conc. (µg/mL) 10000.3 nitial 1000.0 Final +/- (µg/mL) Uncertainty Expanded 22 7803-55-6 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) 0.05 mg/m3 **SDS Information** orl-rat 58.1mg/kg LD50 3165 NIST SRM

| 7/2         | P. 50<br>M. 50<br>M. 50 | m/z->-<br>5,0E8 | 1.0E7 | m/z-> | 1.0E6 | 2.006 |
|-------------|-------------------------|-----------------|-------|-------|-------|-------|
|             |                         |                 |       |       |       |       |
| 210         |                         | 110             |       | 0     |       |       |
| 220         |                         | 1<br>20         |       | N.    |       |       |
| Ö           |                         | Ö               |       | O     |       |       |
| N<br>G<br>O |                         | 130             |       | 90    |       |       |
| N:          |                         |                 |       |       |       |       |
| 200         |                         | 140             |       | 0     |       |       |
| N 50        |                         | 50              |       | 50    |       |       |
| B4          |                         |                 |       |       |       | ı     |
| 260         |                         | 160             |       | 60    |       |       |
|             |                         | 170             |       | 70    |       |       |
|             |                         |                 |       |       |       |       |
|             |                         | <b>d</b> .      |       | 80    |       |       |
|             |                         | 190             |       | 90    |       |       |
|             |                         |                 |       |       |       |       |
|             |                         | 200             |       | 100   |       |       |

Part # 57023



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

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

|                | r     | -             | _   | -      | -            | -          | _     | =             | -  |                   | T        | ۰ |
|----------------|-------|---------------|---|--------|--------------|------------|-------|---------------|--|-------------------|----------|---|
|                | L     | <b>#</b> !    | <u> </u>                                      | Ве     | Ва           | AS         | . 5   | <i>?</i>      | ≥  | Time to           |          |   |
|                | 2000  | A 8           | 4   | 40.01  | <u>8</u> .63 | 707        | 6.02  | 3             | 40,02  |                   |          |   |
|                | 3     | 3 8           | 3 1   | Ç      | చి           | 8          | 2     | ?             | 8  | William Street    |          |   |
|                | 20.02 | 3 8           | 2 3   | 3      | 40.02        | 20.02      | 2 6   | 5             | <b>A</b> 0.02  | STATE AND PERSONS |          |   |
|                | 2     | <u> </u>      | 9 6   | ე<br>ე | <u>ද</u>     | E          | 1 5   | 7 .           | Ž  | Walter Street     |          |   |
|                | 20.02 | 6.6.6         | 2 6   | 3      | A (0.02      | 40.02      | 20.02 | 000           | A) (3)   |                   |          |   |
|                | 70    | 2 5           | 7 7   | 57     | ="           | ii.        | НО    | 1             | HF   |                   |          |   |
|                | 20.02 | 80.02         | 3 6   | 3      | 8            | A).02      | 40.02 | 40.04         | 200  |                   | Irace M  |   |
|                | Z     | MO            | , <u>, , , , , , , , , , , , , , , , , , </u> |        | <u></u>      | Mg         | Ē     | , [           |  |                   | letals   |   |
| (T) = Tarc     | A),02 | 20.02         | 2 6   | 0 00   | A<br>23      | 10.05      | 40.02 | 40.02         | 303  |                   | Verifica |   |
| Target analyte | E     | 7             | ٠,  | , ;    | 2            | ဝ္ဂ        | 3     | 2             |  | ı                 | tion     |   |
| yte            | A0.2  | 40.02         | 40.02   | 20.02  | 3            | A<br>20.02 | 40.02 | 20.02         |  | ŀ                 | by ICP-N |   |
|                | Sc    | Sm            | Ru  | 3      | <u> </u>     | 2          | Re    | 7             |  | ŀ                 | E<br>S   |   |
|                | 40.02 | 40.02         | 40.02   | 20.02  | 3            | A (5)      | <0.02 | 40.02         |  | ľ                 |          |   |
|                | Ta    | s             | Sr  | N      |              | Ag         | Si    | æ             |  |                   |          |   |
|                | <0.02 | <b>40,02</b>  | A0.02   | 40.2   | 5 6          | A) (3)     | A.02  | 40.2          |  | -                 |          |   |
|                | H     | Sh            | Tm  | In     | :            | 1          | Te    | 4             |  |                   |          |   |
|                | <0.02 | <0.02         | <0.02   | <0.02  | 20.02        | 400        | 40.02 | <b>∆</b> 0.02 | STREET, STREET |                   |          |   |
|                | Zr    | Zn            | ×   | Ϋ́     |              | ۷          | d     | ¥             | Wilder Street  |                   |          |   |
|                | <0.02 | <b>∆</b> 0.02 | 40,02   | <0.02  | -            | -)         | A).02 | 40.02         |  |                   |          |   |

### Physical Characterization:

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