

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

8900, Fax: 908 789 8922

Prep Standard - Chemical Standard Summary

| Order | ID : | P3609 |
|-------|------|-------|
| | | |

Test: Metals Group5

Prepbatch ID: PB164372,

Sequence ID/Qc Batch ID: LB133110,

| ~ . | | _ | |
|------|--|-------|--|
| Star | | | |
| | | | |

MP81119,MP82127,MP82441,MP82476,MP82477,MP82478,MP82479,MP82485,MP82486,MP82487,MP82488,MP82491,MP82492,MP82711,MP82712,

Chemical ID:

 $\begin{array}{l} M4960, M5130, M5192, M5218, M5223, M5288, M5295, M5296, M5390, M5394, M5429, M5467, M5498, M5515, M5658, M5697, M5698, M5747, M5748, M5769, M5799, M5800, M5801, M5802, M5806, M5814, M5815, M5816, M5817, M5818, M5819, M5820, M5875, M5935, M5962, M5963, M5970, M5978, M5982, M5984, M6000, M6009, M6021, M6023, M6028, M6030, M6034, M6037, M6040, W2606, W3112, \\ \end{array}$



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone \; : \; 908 \; 789 \; 8900, \\$

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | ScaleID | PipetteID | Supervised By | | |
|--------------|--------------------|-----|------------|--------------------|----------------|---------------|-------------|-----------------|--|--|
| 169 | 1:1HNO3 | | 06/21/2024 | | | METALS_SCA | <u> </u> | Sarabjit Jaswal | | |
| | | | | | | LE_2 (M SC-2) | ETTE_1 (ICP | 06/21/2024 | | |
| FDOM | A) A) A) A) A) | | | | | | | | | |

| <u>FROM</u> | 1250.00000ml of M5935 | + 1250.00000mi of v | /V2606 = Final Quantity | : 2500.000 mi |
|-------------|-----------------------|---------------------|-------------------------|---------------|
| | | | | |

| Recipe | NAME | No | D D.4. | Expiration | <u>Prepared</u> | 0 1 - 1 D | Disc. 44 - ID | Supervised By |
|------------------|-------------|----------------|-------------------------|---------------------------|---------------------------------|------------------------|-------------------|-----------------|
| <u>ID</u> 170 | NAME 1:1HCL | NO. MP82127 | Prep Date 09/03/2024 | <u>Date</u> 02/08/2025 | <u>By</u> Janvi Patel | <u>ScaleID</u> None | PipetteID None | Sarabjit Jaswal |
| | | | | | | | | 09/03/2024 |

FROM 1250.00000ml of M6040 + 1250.00000ml of W3112 = Final Quantity: 2500.000 ml



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone \; : \; 908 \; 789 \; 8900, \\$

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID 1 | <u>NAME</u> | NO. | Prep Date | Expiration Date | <u>Prepared</u> <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabjit Jaswal |
|----------------|-------------------------------|---------|------------|--------------------|------------------------------|----------------|------------------|-----------------|
| 902 I | ICP AES CAL BLK (SO/ICB/CCB) | MP82441 | 09/23/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 125.00000ml of M6040 + 2350.00000ml of W3112 + 25.00000ml of M6037 = Final Quantity: 2500.000 ml

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 907 | ICP AES STD S (S5) | MP82476 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 5.00000ml of M5296 + 5.00000ml of M5394 + 5.00000ml of M5802 + 5.00000ml of M5816 + 5.00000ml of M5820 + 5.00000ml of M5875 + 5.00000ml of M5970 + 5.00000ml of M5982 + 460.00000ml of MP82441 = Final Quantity: 500.000 ml





Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 910 | ICP AES STD S4 | MP82477 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 50.00000ml of MP82441 + 50.00000ml of MP82476 = Final Quantity: 100.000 ml

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 909 | ICP AES STD S3 | MP82478 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 25.00000ml of MP82476 + 75.00000ml of MP82441 = Final Quantity: 100.000 ml



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone: \; 908 \; 789 \; 8900, \\$

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 3913 | ICP AES STD S2 | MP82479 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 16.00000ml of MP82476 + 184.00000ml of MP82441 = Final Quantity: 200.000 ml

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 912 | ICP AES ICV SOLN | MP82485 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 0.02500ml of M5429 + 0.02500ml of M5815 + 0.02500ml of M5817 + 0.02500ml of M5982 + 0.25000ml of M5218 + 10.00000ml of M5295 + 89.77500ml of MP82441 = Final Quantity: 100.000 ml



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone \; : \; 908 \; 789 \; 8900, \\$

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 904 | ICP AES ICSA SOLN | MP82486 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 25.00000ml of M5130 + 225.00000ml of MP82441 = Final Quantity: 250.000 ml

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 3494 | ICP AES ICSAB SOLN-1 | MP82487 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 0.01000ml of M5815 + 0.01000ml of M5817 + 0.10000ml of M5296 + 0.10000ml of M5970 + 0.10000ml of M5982 + 10.00000ml of M5130 + 10.00000ml of M5223 + 79.50000ml of MP82441 = Final Quantity: 100.000 ml





Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Sarabiit Jaswal |
|--------------|------------------|------------|------------|--------------------|---------------------|----------------|------------------|-----------------|
| 911 | ICP AES CCV SOLN | MP82488 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 50.00000ml of MP82441 + 50.00000ml of MP82476 = Final Quantity: 100.000 ml

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 919 | ICP AES INTERNAL STD | MP82491 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 1.00000ml of M5984 + 10.00000ml of M4960 + 1969.00000ml of W3112 + 20.00000ml of M5963 = Final Quantity: 2000.000 ml



284 Sheffield Street, Mountainside, New Jersey 07092, Phone: 908 789 8900,

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|--------------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 903 | ICP AES RINSE SOLN | MP82492 | 09/24/2024 | 10/30/2024 | Kareem Khairalla | None | None | 09/24/2024 |

FROM 200.00000ml of M6034 + 9800.00000ml of W3112 = Final Quantity: 10000.000 ml

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|--------------------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 2950 | ICP AES S1/CRI STOCK STD | MP82711 | 10/07/2024 | 10/30/2024 | Kareem Khairalla | None | None | 10/07/2024 |

FROM

0.00300 ml of M6028 + 0.03000 ml of M5798 + 0.05000 ml of M5515 + 0.05000 ml of M5658 + 0.05000 ml of M6030 + 0.05000 ml of M6030 + 0.05000 ml of M6030 + 0.05000 ml of M5697 + 0.10000 ml of M5698 + 0.10000 ml of M5801 + 0.10000 ml of M5820 + 0.10000 ml of M5962 + 0.10000 ml of M5970 + 0.10000 ml of M5982 + 0.15000 ml of M5800 + 0.20000 ml of M5748 + 0.20000 ml of M5799 + 0.20000 ml of M5819 + 0.20000 ml of M6021 + 0.20000 ml of M6023 + 0.25000 ml of M5467 + 0.25000 ml of M5800 + 0.50000 ml of M5390 + 0.50000 ml of M5814 + 1.00000 ml of M5912 + 1.00000 ml of M5818 + 1.00000 ml of M5818 + 77.68000 ml of M5818 + 77.68000 ml of M582441 = Final Quantity: 100.000 ml



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone \; : \; 908 \; 789 \; 8900, \\$

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabiit Jaswal |
|--------------|----------------------------------|------------|---------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 2951 | ICP AES S1/CRI WORK STD | MP82712 | 10/07/2024 | 10/30/2024 | Kareem Khairalla | None | None | 10/07/2024 |
| FROM | 2.00000ml of MP82711 + 98.00000m | of MP8244 | 11 = Final Qu | antitv: 100.000 | ml | | | |

FROM 2.00000ml of MP82711 + 98.00000ml of MP82441 = Final Quantity: 100.000 ml



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|--|--------------|--------------------|----------------------------|--------------------------------|-----------------------|
| Inorganic Ventures | CGIN10-5 / INDIUM 1 x 500 ml | 100721 | 10/07/2024 | 10/09/2021 / jaswal | 10/08/2021 / jaswal | M4960 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| EPA | PART A / ICSA (ICP) STOCK SOLN | ICSA-1211 | 11/19/2024 | 05/20/2024 / bin | 04/20/2021 / bin | M5130 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57042 / Mo, 1000 PPM, 125 ml | 051722 | 05/17/2025 | 07/01/2022 / bin | 06/17/2022 / jaswal | M5192 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti | S2-MEB711674 | 11/02/2026 | 07/01/2022 / bin | 09/10/2021 / bin | M5218 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| | | | | | 0.4/0.0/0.004 | |
| EPA | PART B / ICSAB (ICP) STOCK SOLN | ICSB-0710 | 11/19/2024 | 05/20/2024 / bin | 04/20/2021 / bin | M5223 |
| EPA Supplier | | ICSB-0710 | Expiration Date | | | M5223 Chemtech Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|------------------------------|---|--------------|-----------------------------|----------------------------|--|-----------------------|
| EPA | ICV-1 / ICV (ICP/ICPMS) STOCK SOLN | ICV-1014 | 02/05/2025 | 08/07/2024 / jaswal | 02/20/2020 / bin | M5295 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | Z9651Q / CHEM-CLP-4/.25L | S2-MEB711673 | 11/02/2026 | 09/19/2022 / jaswal | 08/20/2022 / jaswal | M5296 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57056 / Ba, 1000 PPM, 125 ml | 072122 | 07/21/2025 | 08/07/2024 / jaswal | 09/18/2022 / bin | M5390 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| | | | | | | |
| Inorganic Ventures | CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL | T2-MEB714159 | 01/13/2027 | 11/28/2022 / bin | 09/19/2022 / bin | M5394 |
| | | T2-MEB714159 | 01/13/2027 Expiration Date | | | M5394 Chemtech Lot # |
| Ventures | SOLUTION #3, 125mL | | Expiration | bin Date Opened / | bin Received Date / | Chemtech |
| Ventures Supplier Absolute | SOLUTION #3, 125mL ItemCode / ItemName 57103 / Li, 10000 PPM, | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By 01/26/2023 / | Chemtech Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 58120 / Ca, 10000 PPM, 500 ml | 031523 | 03/15/2026 | 08/15/2023 / jaswal | 03/17/2023 / bin | M5498 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58126 / Fe, 10000 PPM, 500 ml | 092122 | 09/21/2025 | 08/01/2024 / Jaswal | 03/17/2023 / bin | M5515 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58024 / Chromium, Cr, 500 ml, 1000 PPM | 060523 | 06/05/2026 | 08/28/2023 / jaswal | 08/25/2023 / jaswal | M5658 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58029 / Cu, 1000 PPM, 500 ml | 102523 | 10/25/2026 | 04/03/2024 / jaswal | 10/27/2023 / jaswal | M5697 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58025 / Mn, 1000 PPM, 500 ml | 102623 | 10/26/2026 | 04/18/2024 / jaswal | 10/27/2023 / jaswal | M5698 |
| | | Lot # | Expiration | Date Opened / | Received Date / | Chemtech Lot # |
| Supplier | ItemCode / ItemName | 201 " | Date | Opened By | Received By | LOI # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | / Nickel (Ni) 1000PPM | 091223 | 09/12/2026 | 01/02/2024 / bin | 12/20/2023 / jaswal | M5748 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58112 / Mg, 10000 PPM, 500 ml | 091823 | 09/18/2026 | 05/24/2024 / Jaswal | 01/03/2024 / bin | M5769 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57004 / Be, 1000 PPM, 125 ml | 102523 | 10/25/2026 | 02/09/2024 / bin | 02/09/2024 / bin | M5798 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57050 / Sn, 1000 PPM, 125 ml | 071123 | 07/11/2026 | 02/09/2024 / bin | 02/09/2024 / bin | M5799 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Absolute Standards, Inc. | 57027 / CO, 1000 PPM, 125 ml | 091923 | 09/19/2026 | 05/31/2024 / bin | 02/09/2024 / bin | M5800 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Absolute Standards, Inc. | 57033 / As, 1000 PPM, 125 ml | 111323 | 11/13/2026 | 02/09/2024 / bin | 02/09/2024 / bin | M5801 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|----------------------------------|-----------------|--------------------|----------------------------|--------------------------------|-----------------------|
| Absolute Standards, Inc. | 57051 / Sb, 1000 PPM, 125 ml | 120523 | 12/05/2026 | 08/07/2024 / jaswal | 01/03/2024 / jaswal | M5802 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58111 / Na, 10000 PPM, 500 ml | 122223 | 12/22/2026 | 08/01/2024 / Jaswal | 01/03/2024 / jaswal | M5806 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57005 / B, 1000 PPM, 125 ml | 071123 | 07/11/2026 | 03/26/2024 / Sohil | 01/03/2024 / jaswal | M5814 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57115 / P, 10000 PPM, 125 ml | 041723 | 04/17/2026 | 05/21/2024 / Jaswal | 02/09/2024 / jaswal | M5815 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| | | | | 05/00/0004 | 02/09/2024 / | |
| Absolute Standards, Inc. | 57016 / S, 1000 PPM, 125 ml | 122923 | 12/29/2026 | 05/20/2024 / Jaswal | jaswal | M5816 |
| | | 122923 Lot # | Expiration Date | | | M5816 Chemtech Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|--|---------------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57014 / Si, 1000 PPM, 125 ml | 122023 | 12/20/2026 | 03/06/2024 / jaswal | 02/09/2024 / jaswal | M5818 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58030 / Zinc, Zn, 500 ml, 1000 PPM | 111623 | 11/16/2026 | 03/20/2024 / jaswal | 02/09/2024 / jaswal | M5819 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57015 / P, 1000 PPM, 125 ml | 091123 | 09/11/2026 | 05/01/2024 / jaswal | 02/09/2024 / jaswal | M5820 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL | T2-MEB714417 | 01/27/2027 | 04/19/2024 / jaswal | 02/22/2024 / jaswal | M5875 |
| | | | | | | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Supplier Seidler Chemical | ItemCode / ItemName BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L) | Lot # 24D1062002 | - | - | | |
| | BA-9598-34 / Nitric Acid, | | Date | Opened By 06/21/2024 / | Received By 06/07/2024 / | Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|------------------------------|--|---------------------|--------------------|--------------------------------|--------------------------------|-------------------|
| Seidler Chemical | BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L) | 24B1362001 | 01/04/2025 | 07/09/2024 / Al-Terek | 07/03/2024 / Al-Terek | M5963 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57003 / Li, 1000 PPM, 125 ml | 061224 | 06/21/2027 | 07/01/2024 / Jaswal | 07/01/2024 / Jaswal | M5970 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CGTI1-1 / TITANIUM 125mL 1000ug/mL | T2-TI719972 | 06/17/2027 | 08/07/2024 / jaswal | 02/22/2024 / Jaswal | M5978 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57038 / Sr, 1000 PPM, 125 ml | 031524 | 03/15/2027 | 07/01/2024 / Jaswal | 06/11/2024 / Jaswal | M5982 |
| | | | Evaluation | Date Opened / | Received Date / | Chemtech |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Opened By | Received By | Lot # |
| Supplier Inorganic Ventures | ItemCode / ItemName CGY10-1 / YTTRIUM 125mL 10,000ug/mL | Lot # V2-Y740548 | | • | | |
| Inorganic | CGY10-1 / YTTRIUM | | Date | Opened By 08/05/2024 / kareem | Received By 06/14/2024 / | Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|--|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml | U2-MEB731108 | 03/17/2028 | 08/13/2024 / Jaswal | 05/14/2024 / Jaswal | M6009 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57023 / V, 1000 PPM, 125 ml | 062424 | 06/24/2027 | 09/28/2024 / jaswal | 08/05/2024 / Jaswal | M6021 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57081 / TI, 1000 PPM, 125 ml | 0624724 | 06/27/2027 | 08/05/2024 / kareem | 08/05/2024 / Jaswal | M6023 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Absolute Standards, Inc. | 57048 / Cd, 1000 PPM, 125 ml | 070124 | 07/01/2027 | 08/05/2024 / kareem | 01/25/2019 / Jaswal | M6028 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57047 / Ag, 1000 PPM, 125 ml | 122823 | 12/28/2026 | 08/05/2024 / kareem | 08/05/2024 / Jaswal | M6030 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute | 58113 / Al, 10000 PPM, 500 ml | 011623 | 01/16/2026 | 08/07/2024 / Jaswal | 01/03/2024 / Jaswal | M6033 |



Fax: 908 789 8922

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|------------------|---|---------------------|--------------------|----------------------------|--------------------------------|-------------------|
| Seidler Chemical | BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L) | 24D1062002 | 02/01/2025 | 08/06/2024 / Janvi | 08/01/2024 / Janvi | M6034 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Seidler Chemical | BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L) | 24D1062002 | 02/02/2025 | 08/24/2024 / Janvi | 08/01/2024 / Janvi | M6037 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Seidler Chemical | BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L) | 24D1562005 | 02/08/2025 | 08/09/2024 / Janvi | 08/01/2024 / Janvi | M6040 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Seidler Chemical | DIW / DI Water | Daily Lab-Certified | 10/24/2024 | 10/24/2019 / apatel | 10/24/2019 / apatel | W2606 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Seidler Chemical | DIW / DI Water | Daily Lab-Certified | 07/03/2029 | 07/03/2024 / Iwona | 07/03/2024 / Iwona | W3112 |

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

www.absolutestandards.com

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

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

| | | ₩ ! | 묤 | Ве | ן ל | 炗 | As | . 0 | ç | 2 | | I | | |
|-------------------------------|--------------|--------|--------------|--------------|---------------|-------|--------------|-------------|-------|---------------|--|----------|----|--|
| | 10.04 | 200 | A (2) | 10.02 | 0.02 | 3 | 4 | 20.02 | 3 | ♦ 0.02 | | | | |
| | 2 | 2 8 | 3 | Ţ. |) { | , | င္ပ | 2 | ? | 2 | | | | |
| | 70.02 | 2 6 6 | 8 | 40.02 | 20.02 | 3 | <u>8</u> .92 | 2.0 | 5 | H | | | | |
| | - Au | } { | 3 | G | 2 | 2 | 달 | Ę | , t | Ų | | | | |
| | 20.02 | 3 6 | 3 | 40.02 | 20.02 | 3 | 8 | 40.02 | | 0.02 | The second second | | | |
| | 20 | 2 5 | , | 4 | ing. | 4 | 5 | Ho | : | H | | L | 4 | |
| | 20.02 | 20.02 | 3 | ∆ 0,2 | <0.02 | 3 | A Si | 40.02 | 1 1 | 40.02 | STORES STORES | I de Me | -1 | |
| | 20 | MIO | 5, | He | Mn | , , | ₹ | 5 | 1 | E | STATE OF THE PARTY | אפרשוט | 5 | |
| (T) = Target analyte | 40,02 | 20.02 | 5 | ∆ 0.2 | <0.02 | | ≙ 01 | <0.02 | | 40.00 | | vernica | 1 | |
| jet anal | × | 7 | , | 9 | Pd | | <u>ک</u> | Ş | : | Z. | | Con | | |
| yte | A0.22 | \$0.02 | | A) (2) | <0.02 | 10.00 | 3 | <0.02 | 40.02 | 20.00 | | יטע וכף- | | |
| | Sc | Sm | • | 2 | RЪ | 1 | <u> </u> | Re | 1.1 | P | | MU | | |
| | 40.02 | 40.02 | | ∆ | ∆ 0,02 | 20.02 | 3 | 40.02 | 10.02 | 000 | | Jg/mL) | | |
| | Ta | S | | ę | Z | 200 | > | S. | č | 200 | Spillings | | ı | |
| | Ð.02 | 40.02 | 40.04 | 3 | 40.2 | 20.02 | 3 | <u>0.02</u> | 7.03 | à | | | | |
| | Ti | Sn | 1111 | 7 | 7 | 1 | 3 | i. | 10 | | | | | |
| | <0.02 | 40.02 | 20.07 | 3 | ₩ | 20.02 | 3 | 40.02 | 20.02 | 500 | Age of the owner that the | | | |
| | Zt | Zn | | < | ¥ | ~ | 7 | _ _ | * | | | | | |
| | <0.02 | <0.02 | 20.02 | 3 | 40.02 | 20.02 | | 40.02 | 70.02 | | MATERIAL SECTION AND ADDRESS OF THE PERSON A | | | |

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_{CRM/RM}, where two or more methods of characterization are Certified Value, X_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = 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 ($u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$)^{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_{char a} = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT **HF Note:** This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

| | | - | |
|------------------------------|----------------------------------|--------------------|-----------|
| | | | |
| This CDM/DM should not be us | and langer than one year (or civ | months in the cook | 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 Sains



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

Density: 1.118 g/mL (measured at 20 ± 4 °C)

Assay Information:

| 133 | ay iiii Oi iii atioii. | | | |
|-----|------------------------|-------------|-----------|--------------|
| | 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_{CRM/RM}, where two or more methods of characterization are Certified Value, X_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = 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 (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ 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_{char a} = 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_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° 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: 800.669.6799; 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 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_{CRM/RM}, where two or more methods of characterization are Certified Value, X_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = 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 (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ 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_{char a} = 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_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° 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

| Sealed TCT Bag C | 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

M6000,M6001,M6002,M6003,M6004,M6005,M6006,M6007,M6008



Certificate of Analysis

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

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-1

Lot Number:

T2-MEB723367

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea: Potassium, 600 μg/mL ea: Phosphorus, 300 μg/mL ea:

Iron,

200 μg/mL ea:

Sodium,

Magnesium, Aluminum, Cerium, Selenium,

Thallium,

100 μg/mL ea:

Lead, Calcium,

80 µg/mL ea: Arsenic, 70 µg/mL ea: Mercury, 50 µg/mL ea: Nickel,

40 μg/mL ea: Chromium,

30 μg/mL ea:

Copper, Boron,

Vanadium,

20 μg/mL ea:

Zinc, Strontium,
Barium, Beryllium,
Cadmium, Cobalt,
Manganese, Lithium,

7.5 µg/mL ea: Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

Assay Information:

| 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 |
| As | ICP Assay | 3103a | 100818 |
| В | ICP Assay | 3107 | 190605 |
| Ва | ICP Assay | 3104a | 140909 |
| Ва | Gravimetric | | See Sec. 4.2 |
| Be | ICP Assay | 3105a | 090514 |
| Ca | ICP Assay | 3109a | 130213 |
| Ca | EDTA | 928 | 928 |
| Cd | ICP Assay | 3108 | 130116 |
| Cd | EDTA | 928 | 928 |
| Се | ICP Assay | 3110 | 090504 |
| Се | EDTA | 928 | 928 |
| Co | ICP Assay | 3113 | 190630 |
| Со | EDTA | 928 | 928 |
| Cr | ICP Assay | 3112a | 170630 |
| Cu | ICP Assay | 3114 | 121207 |
| Cu | EDTA | 928 | 928 |
| Fe | ICP Assay | 3126a | 140812 |
| Fe | EDTA | 928 | 928 |
| Hg | ICP Assay | 3133 | 160921 |
| Hg | EDTA | 928 | 928 |
| K | ICP Assay | 3141a | 140813 |
| K | Gravimetric | | See Sec. 4.2 |
| Li | ICP Assay | 3129a | 100714 |
| Li | Gravimetric | | See Sec. 4.2 |
| Mg | ICP Assay | 3131a | 140110 |
| Mg | EDTA | 928 | 928 |
| Mn | ICP Assay | 3132 | 050429 |
| Mn | EDTA | 928 | 928 |
| Na | ICP Assay | Traceable to 3152A | S2-NA700842 |
| Na | Gravimetric | | See Sec. 4.2 |
| Ni | ICP Assay | 3136 | 120619 |
| Ni | EDTA | 928 | 928 |
| P | ICP Assay | 3139a | 060717 |
| P | Acidimetric | 84L | 84L |
| Pb | ICP Assay | 3128 | 101026 |
| Pb | EDTA | 928 | 928 |
| Se | ICP Assay | 3149 | 100901 |
| Sr | EDTA | 928 | 928 |
| Sr | ICP Assay | Traceable to 3153a | K2-SR650985 |
| TI | ICP Assay | 3158 | 151215 |
| V | IC Assay | 3165 | 160906 |
| V | EDTA | 928 | 928 |
| Zn | ICP Assay | 31 68 a | 120629 |
| Zn | EDTA | 928 | 928 |
| | | | |

Page 4 of 6

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_{CRM/RM}, 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 $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

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

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

k = coverage factor = 2

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$ where u_{char} is 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_{CRMRM}, where one method of characterization is used is the mean of individual results:

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

X_g = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (slorage) u_{ts} = 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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° 24° C to minimize the effects of transpiration. Use at 20° ± 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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 30, 2022

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

11.2 Lot Expiration Date

- August 30, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRMRM can be supported by long term stability studies conducted on properly stored and handled CRMRMs. 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 Da | ate: |
|--|------|
|--|------|

- 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

DD978hi.



Certificate of Analysis

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 **ACCREDITATION / REGISTRATION**

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-2

Lot Number:

U2-MEB731108

Matrix:

5% (v/v) HNO3

tr. HF

Value / Analyte(s):

200 µg/mL ea:

Silica,

80 µg/mL ea: Antimony, 70 µg/mL ea:

Tin,

40 µg/mL ea: Molybdenum, 20 µg/mL ea:

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

ANALYTE Antimony, Sb **CERTIFIED VALUE** 80.1 ± 0.6 µg/mL

Titanium

ANALYTE Molybdenum, Mo **CERTIFIED VALUE** 40.03 ± 0.18 µg/mL

Silica, SIQ2

200.2 ± 1.3 μg/mL

Tin, Sn

 $70.0 \pm 0.4 \, \mu g/mL$

Titanium, Ti

20.01 ± 0.13 µg/mL

Density:

1.025 g/mL (measured at 20 ± 4 °C)

Assay Information:

| ANALYTE Mo | METHOD ICP Assay | NIST SRM# 3134 | SRM LOT# 130418 |
|---------------|---------------------|-------------------|--------------------|
| Мо | Calculated | | See Sec. 4.2 |
| Sb | ICP Assay | 3102a | 140911 |
| SiO2 | ICP Assay | 3150 | 130912 |
| Sn | ICP Assay | 3161a | 140917 |
| П | ICP Assay | 3162a | 130925 |
| Ti | 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_{CRM/RM}, 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}

 $\mathbf{w_j}$ = the weighting factors for each method calculated using the inverse square of the variance:

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

 u_{char} a = 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)

N/Δ

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>
 https://www.inorganicventures.com/terms-and-conditions-sale. 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 $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.Inorganicventures.com/TCT HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 17, 2023

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

11.2 Lot Expiration Date

- March 17, 2028
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

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 3D978hi.

Certifying Officer:

Paul Gaines
Chairman / Senior Technical I

Chairman / Senior Technical Director

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: Lot Number: Description:

58149

100721

Indium (In)

R: 10/08/

Lot #

Solvent: 20370011 Nitric Acid

Gierannie

respective

5%

Nitric Acid

(III) 25.0

> Formulated By: Giovanni Esposito

> > 100721

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

10000

Ambient (20 °C)

Recommended Storage:

Expiration Date:

100724

Weight shown below was diluted to (mL):

500.06

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

Lot

Nominal

Purity Uncertainty Assay

Target

Actual

Actual

Uncertainty

Reviewed By:

Expanded

Pedro L. Rentas

100721

SDS Information

NIST

 Indium Oxide (In) IN086 W1096A RM# Number Conc. (µg/mL) 10000 99.999 8 Purity (%) 0.10 82.6 8 Weight (g) 6.05408 Weight (g) Conc. (µg/mL) 6.05441 10000.6 +/- (µg/mL) 20.1 1312-43-2 CAS# (Solvent Safety Info. On Attached pg.)
OSHA PEL (TWA) LD50 NA Z 3124a SRM

| 10 20 30 40 50 60 70 80 90 11 110 120 130 140 150 160 170 180 190 2 | 2.5E6 | 5.0E6 | m/z-> | 1.0E6 | 2.0E6 | m/z-> | 2.5E7 | 5.0E7 |
|--|-------|-------|-------|-------|-------|--------|-------|-------|
| 20 30 40 50 60 70 80 90 | | | | | | | | |
| 20 30 40 50 60 70 80 90 | | | 110 | | | 10 | | |
| 80 70 80 90 160 170 180 190 | | | 120 | | | N O | | |
| 80 70 80 90 160 170 180 190 | | | 130 | | | 30 | | |
| 60 70 80 90 | | | 140 | | | 400 | | |
| 60 70 80 90 | | | 150 | | | 50 | | 2 |
| 180 90 | | | 160 | | | 60 | | |
| 90 | | | 170 | | | 70 | | |
| | | | 180 | | | 80 | | |
| | | | 190 | | | 90 | | |
| | | | 200 | | | 100 | | |



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

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

| | CHILI | - | NO DESCRIPTION OF THE PERSON NAMED IN COLUMN | | | and the | 020 | H | | 179 |
|----------------|-------|-------|--|----------------|-------|---------|-------|----------------------|-------------|-----|
| | ш | Bi | Be | Ва | As | Sb | 2 | | | |
| | 0.02 | <0.02 | <0.01 | 40.02 | 40,2 | <0.02 | <0.02 | | | |
| | 5 | င္ပ | Ç | CS | Çe | Ca | Cd | | | |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 40.2 | <0.02 | | | |
| | Au | ල | Ga | <u>G</u> | 臣 | 먁 | Dy | | | |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | | |
| | B | La | æ | F | In | Но | Hf | NO PROPERTY. | | |
| | <0.02 | <0.02 | <0.2 | <0.02 | 7 | <0.02 | <0.02 | | Trace Me | : |
| | Z. | Mo | Hg | Mn | Mg | Lu | Ľ | | letals | |
| Tarnet analyte | 8 | <0.02 | 40.2 | < 0.02 | 10.05 | <0.02 | <0.02 | | Verificat | |
| anaktu | ~ | P | P | Pd | 0° | S. | Z | | d noi: | |
| | 3 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | y ICP-MS | |
| 5 | s | Sm | R _L | Rb | Rh | Re | Pr | | (lig | |
| 20.00 | 4000 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | <u>m</u> L) | |
| 100 | 1 | S | Sr | N _a | Ag | Si | Se | | | |
| 20.02 | 3 | <0.02 | <0.02 | 40.2 | <0.02 | 40.02 | <0.2 | | | |
| | 1 | Sn | Tm | T | 11 | Te | Тb | | | |
| 20.02 | 3 | 40.02 | 40.02 | 40.02 | <0.02 | <0.02 | <0.02 | | | |
| 1 | 7, | Zn | Y | 4 | < | C | W | | | |
| 70.02 | 3 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | P. Land B. Committee | | |

(I)= larger 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).





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 HNO₃. 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 HNO₃. 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 (µg/L) | Low Limit (µg/L) | High Limit (µg/L) | Part A +Part B (µg/L) | Low Limit (µg/L) | High Limit (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 |
| Ва | 200 | (6.0) | -194 | 206 | (537) | 337 | 737 |
| Be | 5.0 | (0.0) | -5.0 | 5.0 | 495 | 420 | 570 |
| Cd | 5.0 | (1.0) | -4.0 | 6.0 | 972 | 826 | 1120 |
| 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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

M.5192 R: 06/17/2

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

CERTIFIED WEIGHT REPORT: Ammonium molybdate (Mo) Compound Nominal Concentration (µg/mL): m/z-> M/z-> Recommended Storage: m/z-> Volume shown below was diluted to (mL): 2.0E6 1.0E6 1.0E5 2.0E5 2000 1000 **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 58142 Number Part **BTU9** 1000 57042 Ambient (20 °C) 051722 051725 Molybdenum (Mo) 022222 Fot 120 220 20 [8.594 sec]:57042.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 230 30 5E-05 300.0 Vol. (mL) 0.058 Initial Flask Uncertainty Balance Uncertainty Pipette (mL) Conc. (µg/mL) Uncertainty 0.084 240 140 40 MKBQ8597V Ammonium hydroxide Nominal Lot # 0.5% 1000 250 150 50 Conc. (µg/mL) 10001.0 Initial (III) 15.0 160 260 60 Conc. (µg/mL) Ammonium hydroxide 1000.0 Final 170 70 Formulated By: Reviewed By: Uncertainty +/- (µg/mL) Expanded 2.1 180 80 13106-76-8 (Solvent Safety Info. On Attached pg.) Lawrence Barry OSHA PEL (TWA) Pedro L. Rentas 5 mg(Mo)/m3 190 90 SDS Information 200 100 orl-rat 333 mg/kg 051722 051722 3134 SRM TSIN

Printed: 6/16/2022, 1:36:08 PM

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

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

| | | 6 | o ! | B . | Be | 1 20 | Z, | As | | 2 | A | | | |
|---------------------|-------|-------|-------|------------|----------|-------|-------|----------|-------|--------|--------|--|----------|---------|
| | | H | | A 073 | | _ | | | | | - | Personal property and party and part | | |
| | | | | | | _ | | | | | _ | | | |
| | | 5 | . 6 | 3 | <u>υ</u> | 5 | | <u>چ</u> | 2 | | 5 | THE PERSON NAMED IN | | |
| | | 40.02 | 20.02 | 3 | 0.02 | 20.02 | 3 | 40.02 | 2.03 | 3 | 40.02 | | | |
| | | Au | ç | , | റ്റ | G | 1 | ij | H | , | ρ | | | |
| | | 0.02 | 20.02 | 0 0 | 40.02 | <0.02 | 0.01 | 2 | <0.02 | | <0.02 | | | |
| | | 8 | 4 | , ; | Î) | ŀ | E | 5 | H | ; | ¥ | | | |
| | | 8 | 40.02 | 6 | 7 | 40.02 | 20.02 | 3 | 0.02 | 10.04 | A) (7) | | 11000 | Trace |
| | I | Z | Mo | 1100 | Ş | M | SIM | = | Ę | Ē | Ti | | ic cal | Aptole |
| j | 20.02 | 3 | Н | 707 | 3 | 40.02 | 10.05 | | A0.02 | 20.02 | 2000 | | ACTUIC | Vorific |
| (T)= Target analyte | , | Κ | 7 | ۲, | J . | 2 | S | , | 3 | 2 | N | | acioi | ±. |
| analyte | 20.2 | 3 | A),02 | 20.02 | | A).02 | <0.02 | | A 93 | 20.02 | 2000 | | יאן וער- | 5 |
| | 30 | 2 | Sm | Ku | , ; | Z . | R | | 20 | · : | 7 | | CMC | 1 31 |
| | 20.02 | 3 | 40.02 | <0.02 | 10.0 | 2 | 40.02 | 10:02 | 3 | 40.02 | | | 19/IIIL) | / / / |
| | 12 | 3 (| · n | Sr | 146 | Z | Ag | 2 | e. | Se | | | | |
| | <0.02 | 20.02 | A 3 | <0.02 | 10. | 3 | 40.02 | 20.02 | 3 | A).2 | | | | |
| | Ti | 1 2 | S | Tm | 111 | 7 | = | LC | 7 | 7 | | | | |
| | <0.02 | 10.02 | 3 | 40.02 | 20.02 | 3 | <0.02 | 20.02 | 3 | 0.02 | | | | |
| | 72 | 1 | 7, | Y | 10 | 5 | < | _ | : | ¥ | | | | |
| | <0.02 | 20.02 | 3 | <0.02 | 20.02 | | 40.02 | 20.02 | | <0.02 | | | | |

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).

Part # 57042

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-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_{CRM/RM}, where two or more methods of characterization are Certified Value, X_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = 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 ($u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$)^{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_{char a} = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT **HF Note:** This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

| | | - | |
|------------------------------|----------------------------------|--------------------|-----------|
| | | | |
| This CDM/DM should not be us | and langer than one year (or civ | months in the cook | 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





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 HNO₃. 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 HNO₃. 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 (µg/L) | Low Limit (µg/L) | High Limit (µg/L) | Part A +Part B (µg/L) | Low Limit (µg/L) | High Limit (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 |
| Ва | 200 | (6.0) | -194 | 206 | (537) | 337 | 737 |
| Be | 5.0 | (0.0) | -5.0 | 5.0 | 495 | 420 | 570 |
| Cd | 5.0 | (1.0) | -4.0 | 6.0 | 972 | 826 | 1120 |
| 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

3

Certified Reference Material CRM

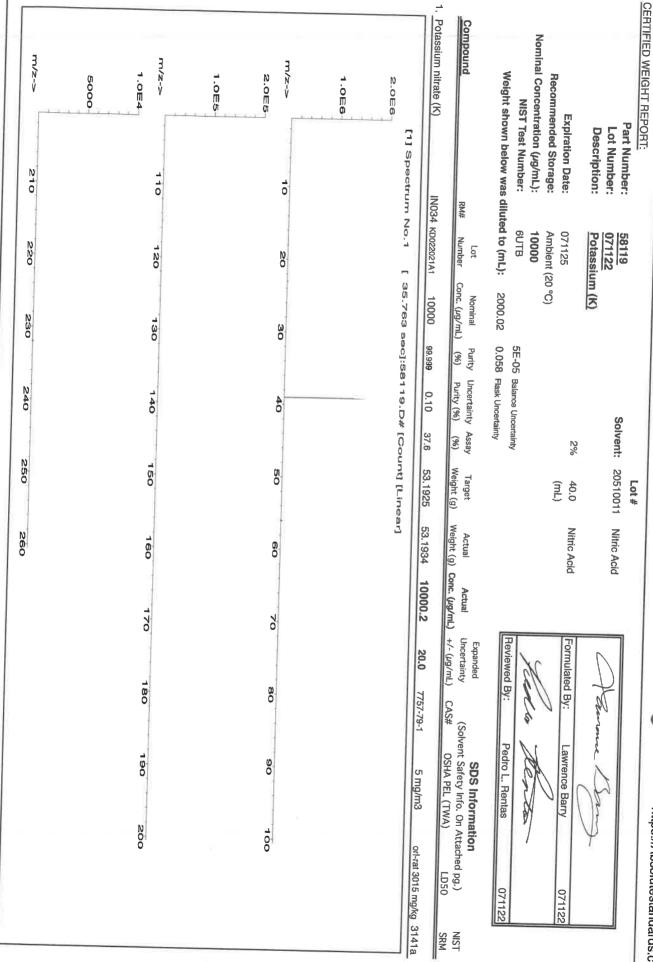
www.absolutestandards.com

800-368-1131

Absolute Standards, Inc.



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



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

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

| Physical Characterization: | Al <0.02 Cd <0.02 Dy Sb <0.02 Ca <0.02 En As <0.02 Ca <0.02 En Ba <0.02 Ca <0.02 En Ba <0.02 Ca <0.02 Gd Bi <0.02 Ca <0.02 Ga Bi <0.02 Ca <0.02 Ga | |
|----------------------------|--|---|
| 23 10,002 43 | <0.02 Hf <0.02 Li <0.02 Ni <0.02 Pr <0.02 Se <0.2 Tb <0.02 W <0.02 <0.02 | Trace Metals Verification by ICP-MS (µg/mL) |

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.

* 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 # 58119



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) K₂Cr₂O₇ 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 K₃Fe(CN)₆, 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) (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) (after 100-fold dilution) |
| Hg | 4.0 | CN- | 99 |

www.absolutestandards.com

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):

| | | | | | | | Trace M. | otolo | Vorifico | 201 | F. CO | 2 | | | | | | ı | |
|-----|-------|---|--------|-----|--|----------|-------------------|-------|----------|-------|---|--------|---|-----|-------|------|-------|-------|-------|
| | | | | | | | 1 | Cars | ۱^ | | ייין כו | 20 | ng/mr) | | | | | | |
| | | | | | The state of the s | | The second second | | | | | | | | | | | ı | |
| I V | <0.02 | ొ | <0.02 | δ | <0.02 | HF | <0.02 | ï | <0.02 | Z | <0.02 | ď | <0.00 | 32 | 6 | É | 89 | 1 487 | 000 |
| Sb | <0.02 | ű | <0.5 | į. | 200 | H | 70.00 | - | 200 | 11.11 | 000 | , | | 3 ; | 1 | 2 | 70.02 | A | 70.05 |
| A | 4 | , | 100 | 1 1 | 100 | 2 | 70.00 | 7 | 20:05 | 2 | Z0:0> | 2 2 | ₹0.02 | 2 | <0.02 | E e | <0.05 | Þ | <0.02 |
| AS | 7.02 | 3 | Z0:02 | 3 | <0.02 | 드 | <0.02 | Ä | 0.05 | ő | <0.02 | Kh. | 2002 | Αo | 2007 | F | 500 | 7.7 | 5 |
| Ha | € | ێ | 2002 | 2 | 0000 | ,1 | | > | 200 | i | | | *************************************** | Ď, | 70:05 | 17 | 70.02 | > | 70:05 |
| | ٠. | 3 | *0°0 | 3 | 7000 | = | 70.0> | IMIM | 70:0> | | <0.02 | 8 | \$0.05 \$0.05 | Z | 95 | É | 000 | 5 | 500 |
| Be | <0.01 | Ö | <0.02 | Sa | <0.02 | 윤 | 40.2 | He | <0.2 | ۵ | 2000 | Ϋ́ | 2007 | ů | 60 | | | ; ; | 70.00 |
| B. | Q (Q) | 2 | 2002 | ď | 000 | - | 600 | 2 | 400 | . , | *************************************** | 1 | 70'07 | วี | 70'05 | EI T | Z0:02 | - | Q.02 |
| i | 000 | 3 | - N.O. | 3 | 7000 | Š | 70'0> | Mo | Z0:02 | = | <0.02 | Sm | 40.02 | S | <0.02 | S | SO 02 | 72 | 2007 |
| 20 | <0.02 | ð | <0.02 | Au | ₹ 0005 | P | <0.02 | Ž | <0.02 | × | <0> | Ž. | 2007 | 5 | 5 | i | 9 9 | 1 | 70.00 |
| | | | | | | | | | | | 100 | 3 | 70.07 | 2 | | _ | | - | |

Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

^{*} 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).

^{*} 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.

^{*} 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

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

<u>ئ</u>

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 | |
|-----|--|---|-----------|-------------|---------------|------------|--|-------|--|--------|-----------------|-------------------|-------|-------------------|----------------------|
| 2 | Byfill 0241 ischin | 2 | | | | | 1 | | | | | | | | |
| W | 0.10 10.0 100.0134 100.0173 10000.4 20.0 7790-69-4 5 mg/m3 oct-24 1428 mg/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 LIZO42018A1 | IN019 | | Lithium nitrate (Li) |
| SRM | 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 (%) | 98 | Conc. (µg/mL) | Number | RM# | | Dunodino |
| L | Attached on) | (Solvent Safety Info, On Attached on.) | (Soly | Uncertainty | Actual | Actual | Target | ASSAY | Nominal Punty Uncertainty Assay Target | runty | Nominal | 707 | i | | 7 |
| | ition | SDS Information | | Expanded | | | | | | | | - | | | |

| 1.056 | 0.0 8 | m/z->∕ 500 250 | 20° 20° 10° 10° 10° 10° 10° 10° 10° 10° 10° 1 | m/z->> |
|--------------------------------------|----------|----------------------|---|----------------------------|
| L'ON EUROPE | | .0 | 0 | 010 |
| _ | ON N | 120 | 880 | |
| 9.619 sec]:58103.D# [Count] [Linear] | | .0 | 086 | 230 |
| 3103.D# [Cc | | 0 | 041 | 0.86 |
| ount) (Linea | | 0 0 | 150 | A Manual Corpo Increased |
| | | .00 | .0 | - We related to Laboratory |
| | | 0 | 0 4 | |
| | | . <mark>0</mark> | 180 | |
| | | .0 | 180 | |
| | | 001 | 800 | |

Printed: 1/18/2023, 4:01:43 PM

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 | ≥ | 40.02 |
| 3 | <0.02 | రి | 40.2 | 山 | <0.02 | Ho | 40.02 | Ē | 40.02 | ź | 40.02 | 2 | Q .02 | SS. | <0.02 | T _e | <0.02 | ח | <0.02 |
| As | ₩2 | ප | <0.02 | 嵒 | <0.02 | 편 | ₹0.02 | Mg | <0.01 | ő | <0.02 | Rh 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 | 40.02 | 괊 | <0.2 | 黑 | \$07 | Δ. | <0.02 | Ra | 900 | J. | <0.02 | ع ا | 8 | * | 200 |
| B. | 40.02 | රි | 40.02 | පී | 20.0 2 | 3 | <0.02 | ₩ W | 40.02 | 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 | 40.02 | E C | <0.02 | E | 000 | 7 1 | 2000 V |

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



Certified Reference Material CRM

R: 03/01/23(12)



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

| | | | | | | | | | - | | | |
|--|------------|-----------------------------------|---|----------|---|------------|-------------------------------|---------------|--|---|------------------------|------|
| CENTIFIED WEIGHT REPORT: | | | | | | Lot # | | |) | | | |
| Part Number: Lot Number: | | 57058 | | | Solven | t: 2111022 | Solvent: 21110221 Nitric Acid | | T | Errore Br | | |
| Description: | | Cerlum (Ce) | 3 | | | | | | | 0 | K | |
| Section 2 | | 00000 | | | 2% | | Nitric Acid | - | Formulated By | : Lawrence Barry | 020623 | Lon |
| Recommended Storage: Nominal Concentration (ug/mL): | | 020626 Ambient (20 °C) 1000 | (Ç) | | | (JE) | | | 1/2 | to Herris | 1 | |
| NIST Test Number: 6UTB Weight shown below was diluted to (mL): | dilute | 6UTB of to (mL): | 1000.12 | 3E-05 E | 5E-05 Balance Uncertainty 0.058 Flask Uncertainty | | : | | Reviewed By: | Pedro L. Rentas | 29020 | |
| | | Ę | | Purity 1 | Nominal Purity Uncertainty Assay. | y Target | Actual | Actual | Expanded Uncertainty | SDS Information (Solvent Safety Info. On Attached pg.) | ation Attached pg.) | NIST |
| Compound | 25. 25. | | Number Conc. (ug/mL) (%) Purity (%) (%) | 3 | Purity (%) (%) | | Weight (g) | Conc. (ug/mL) | Weight (g) Weight (g) Conc. (ug/ml.) +/- (ug/ml.) CAS# | CAS# OSHA PEL (TWA) | 1D50 | SRM |

| Compound | RM# | Lot | Nominal Conc. (vg/mL) | Purity (%) | Purity Uncertainty Assay (%) Purity (%) (%) | Assay (%) | Target Weight (g) | Actual Weight (g) | Actual Actual Uncertainty Weight (g) Conc. (ug/mt.) +/- (ug/mt.) | Uncertainty +/- (ug/mL) | SS | (Solvent Safety Info. On Attached pg.) CAS# OSHA PEL (TWA) LD50 | ched pg.) LD50 | NIST |
|---------------------------------|---------------|----------------|---|---------------|--|--------------|----------------------|----------------------|--|----------------------------|-------|---|-------------------|---------------|
| Cerium nitrate hexahydrate (Ce) | 1N146 | IN146 Z512CEB1 | 1000 | 99.989 | 0.10 | 32.8 | 3.04919 | 3.04921 1000.0 | 1000.0 | 20 | II == | ₹Z | ď Z | AN |
| [1] Spectrum N | lo.1 [43.472 | sec]:58158.D# | [1] Spectrum No.1 [43.472 sec]:58158.D# [Count] [Linear] | | | | | | | Ш | | | | $\ \cdot \ $ |
| 1.0€9_ | | | | | | | | | | | | | | |
| - 1.4 m) 1 | | | | | | | | | | | | | | |
| 5.0E8 | | | | | | | | | | | | | | |
| | * | at. | | | | | | | | | | | | |
| m/2-> | 10 | 20 | 30 | | 40 | | 50 | 0.9 | 70 | | 80 | 001 06 | | |
| 2.0€6□ | | | | • | | | | | | | | | | |
| -1-1 | | | | • | | | | | | | | | | |
| 1,056 | | | | | | | | | | | | ν_{μ} | | |
| 1-1 | | | | | | | | | | | | | | |
| | | | | | , | | | | | | | | | |
| w/2-> | 110 | 120 | 130 | 0 | 140 | | 150 | 160 | 170 | | 180 | 190 200 | | |
| 5.0£7 | | | | 5 | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 2.5E7 | | | | | | | | | | | | | | |

250

240

220

210

Printed: 2/6/2023, 2:46:41 PM

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):

| | 20.0 | 20:0 | <0.02 | 707 | 20:0 | 207 | 707 |
|--------------|-------|----------------|-------|--------------|--------------|--------------|-------|
| | H | _ | _ | _ | _ | _ | _ |
| | = | ב | | → | ¥ | Z | Z |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | ₹0.02 | <0.02 |
| | 110 | Te | E | Ē | Tm | Sn | I |
| | <0.2 | <0.02 | <0.02 | <0.7 | <0.02 | <0.02 | <0.02 |
| | S | S. | Ag | Na | Š | S | Ē |
| /mL) | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| , (µg/ | à: | Re | 뙲 | Rb | Ru | Sm | S |
| by ICP-MS | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.05 | 40.2 |
| | ï | S _o | ő | Pd | а, | 굺 | × |
| Verification | <0.02 | <0.02 | <0.01 | <0.02 | Ø2 | <0.02 | <0.02 |
| letals | n | F | Mg | Mn | Hg | Mo | PN |
| Trace M | <0.02 | <0.02 | <0.02 | <0.02 | 8 | ₹0.02 | <0.02 |
| | 出 | Но | ű | ľг | Fe | Ľ | P |
| | <0.02 | 40.02 | ₹0.02 | <0.02 | <0.00 √ | <0.02 | <0.02 |
| | À | 岿 | 昂 | ਣ | ලී | පී | Au |
| | <0.02 | 40.2 | H | 40.02 | <0.02 | 40.02 | <0.02 |
| | 3 | చ | ඊ | ర | ඊ | රි | ਹੈ |
| | <0.02 | ₹0:05 | 40.2 | <0.02 | Q .01 | <0.02 | <0.02 |
| | A | S | As | Ba | Be | 2 | æ |

Physical Characterization:

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

(T)= Target analyte

My J. M.

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.

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.

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



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 Fot# 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 Number | Nominal Purity Conc. (µg/mL) (%) | Punty (%) | Purity Uncertainty Assay (%) Purity (%) (%) | | Target Weight (g) | Actual 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.) 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 ₁ | [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. 5. 4. | | | | | | | | | | | | | | |
| m/z-> | 0 | 120 | | 90 | 140 | | 150 | 160 | 071 | 0 | 180 | 190 | | |
| 6.0E4 | | | | | | | | | | | | | | |
| m/z-> | 019 | 220 | | 230 | 240 | | 250 | 260 | | | | | | |

Printed: 3/16/2023, 1:45:15 PM





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

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

| | | | | | | | Trace Me | tals | Verificat | io Io Io | by ICP-N | MS (| (ng/mL) | | ı | | | | |
|------------|---------------------------------------|----------------|--|----|---------------------|--|--|------|--|------------------------------|--|------|---------|----------|----------------------|--------------|-------|-------|-------|
| SACTION OF | · · · · · · · · · · · · · · · · · · · | NOT THE OWNER. | STATE OF THE STATE | 1 | THE PERSON NAMED IN | STATE OF THE PARTY | 1500 NOT 150 | | THE STATE OF THE S | STATE OF THE PERSON NAMED IN | STATE OF THE PARTY | 0 | | - Harris | THE REAL PROPERTY OF | THE PARTY OF | | Marke | |
| Ι¥ | <0.02 | జ | <0.02 | Ą | 40.02 | Ħ | <0.02 | LI | <0.02 | Z | <0.02 | P. | <0.02 | Š | <0.2 | 13 | <0.02 | ≱ | <0.02 |
| જ | <0.02 | రే | F | 占 | ₹0.02 | 윒 | ₹0.02 | 3 | 20.02 | ź | <0.02 | æ | <0.02 | ន | <0.02 | Je | <0.02 | Þ | ₹0.02 |
| As | <0.2 | පී | 40.02 | 超 | <0.02 | Я | <0.02 | Mg | 10.0> | ő | <0.02 | 招 | <0.02 | Ag | <0.02 | F | <0.02 | > | <0.02 |
| Ba | <0.02 | ඊ | <0.02 | 3 | <0.02 | ㅂ | <0.002 | Ma | 40.02 | Z | <0.02 | 8 | <0.02 | Z | <0.2 | Ę | <0.02 | χg | 40.02 |
| Be | <0.01 | Ö | <0.02 | පී | 40.02 | Ę. | 40.2 | Hg | <0.2 | ۵, | <0.02 | R | <0.02 | ઢ | <0.02 | E, | <0.02 | 7 | ₹0.02 |
| ã | <0.02 | රි | 40.02 | පි | <0.02 | 2 | <0.02 | Mo | <0.02 | 盂 | <0.02 | Sm | <0.02 | Ø | ₹0.02 | Sn | <0.02 | 2 | <0.02 |
| m | <0.02 | ₫ | <0.02 | Αŭ | <0.02 | £ | <0.02 | PZ | <0.02 | × | 40.2 | Sc | <0.02 | Ta | <0.02 | Ħ | <0.02 | Z | 40.02 |

(T) = Target analyte

Physical Characterization:

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



Certified by:

Printed: 3/16/2023, 1:45:15 PM

^{*} 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.

^{*} 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.

www.absolutestandards.com

Certified Reference Material CRM

R : 03 | 17 | 12



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

Diovanne

Nitric Acid

Solvent: 20510011

#ioj

Nitric Acid

350.0 (m)

7.0%

092122 092122 Giovanni Esposito Pedro L. Rentas Formulated By: Reviewed By:

| SDS Information | (Solvent Safety Info, On Attached pg.) | L) CAS# OSHA PEL (TWA) LD50 |
|-----------------|--|-----------------------------|
| Expanded | Actual Actual Uncertainty | 1/- (ug/mL) |
| | Actual | Conc. (vg/mL) |
| | | _ |
| | arget | Weight (g) |
| | Assay | 9 |
| 1 | unity Unkertality Assay | runty (%) |
| District | L COR | R |
| Mominal | Conc (un/ml) | Collect (Agy IIIIL) |
| ŧ | Number | |
| | RM# | |
| | Compound | |

5E-05 Balance Uncertainty 0.12 Flask Uncertainty

5000.1

Weight shown below was diluted to (mL):

NIST Test Number:

Ambient (20 °C)

10000 **6UTB**

092125

Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):

Iron (Fe) 092122

Description: Lot Number:

Part Number:

CERTIFIED WEIGHT REPORT:

| 128 128 | orl-rat 7500mg/kg 3126a | 5 mg/m3 | 1403-08-0 | Ш | | | | | | | | | | |
|------------|-------------------------|---|---------------|---------------|------------------------------------|--------------|----------------------------|-------|--------------|--------|-------------------|-------------|-------|-----------|
| | | | 200 7430.00.6 | | 0.10 100.0 50.0034 50.0111 10001.5 | 50.0111 | 50.0034 | 100.0 | 0.10 | 99.985 | 10000 | 2224912-500 | IN34¢ | Iron (Fe) |
| N KE | LUSO | (VMI) TI INS | | | | | | | | | | | | |
| 100 | CuCi | OSHA PFI (TWA) | CAS# | +/- (ua/mL) | Conc. (ug/mL) | Weight (g) (| Weight (g) | 9 | Funcy (%) | (8) | COLLEGE (ANY THE) | | | |
| | sched pg.) | eric sarety Into, on Atta | AIDC) | CHICAL COUNTY | | | | | Printer Anna | 100 | Come free free! | Nimbor | RM# | Compound |
| | | Uncertainty Assay Target Actual Actual Innortainty (Cokyon Color Let) | (Coh. | Incortainty | Actual | Actual | y Uncertainty Assay Target | Assay | Uncertainty | Purity | Nominal | 5 | | |

| | | 1143-40 2224912-900 | 2000 | 99:982 | 0.10 | 100.0 | 50.0034 | 50.0111 10001.5 | 10001.5 | 20.0 | 7439-89-6 | 5 mg/m3 | orl-rat 7500mg/kg 3126a |
|-------|---------------|---|------------------|--------|------|-------|---------|-----------------|---------|------|-----------|---------|-------------------------|
| 2.054 | Spectrum No.1 | [1] Spectrum No.1 [30.763 sec];58126.D# [Count] [Linear] | (Count] [Linear] | | | | | | | | | | |
| 1.0E4 | | | | | | | | | | | | | |
| m/z.> | 10 | .O | 30 | | - 4 | | -08 | -09 | | | | _06 | 001 |
| π/2-> | 110 | 120 | 130 | | 140 | | 150 | 160 | 170 | | 180 | | 500 |
| 5.0E7 | | | | | | | | | | | | | |
| 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 | <i>бп</i>) s | /mL) | | | | | | |
|-----------|--------------|----|-----------------|----|-------|----|--------------|-------|-----------|-------|----------|---------------|--------------|----|---------------|------------|-------|----|-------|
| STOREGIS. | 000 | | Sell Production | | 200 | | | | | | | | | | | | | | |
| 4 | 70.02 | 3 | 70.05 | ŝ | 70'0> | Ē | 7070> | 3 | 40,02 | ž | <0.10 | £ | 40.02 | ž | 402 | e | <0.02 | ≥ | 40.02 |
| - Se | 40.02 | ථි | 40.2 | 山 | <0.02 | Ho | 20.02 | 3 | <0.02 | ź | <0.02 | Re | <0.02 | জ | ₹0 ,02 | <u>1</u> 2 | <0.02 | מ | <0.02 |
| As | Ø.2 | ප | <0.02 | 큡 | <0.02 | 멸 | <0.02 | Mg | <0.01 | ő | <0.02 | 꿆 | 40.02 | Ag | <0.02 | F | <0.02 | > | <0.02 |
| Ba | 40.02 | ඊ | Ø.02 | 3 | <0.02 | ㅂ | 40.02 | Mn | <0.10 | 몺 | <0.02 | 8 | <0.02 | g | 40.2 | Ē | <0.02 | Z. | <0.02 |
| Be | ₩ | ŏ | ₹0.05 | පී | <0.02 | 윤 | <0.2 | Hg | 40.2 | ۵ | <0.02 | Ro. | 40.02 | 8 | ₹0.02 | ם | <0.02 | γ. | <0.02 |
| Ä | <0.02 | රි | Ø.10 | ප | 40.10 | ٦ | <0.02 | Wo | 20.0≥ | 조 | <0.02 | Sm | <0.02 | တ | <0.02 | Sn | <0.02 | Zu | <0.05 |
| В | <0.02 | ට | <0.10 | Απ | <0.02 | £ | <0.02 | PR | <0.02 | M | <0.2 | 3 | <0.02 | Ta | <0.02 | H | <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

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: 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 5 10 | 5.0E5 | 5.0E5 | m/z-> | 5000 | 1.004 |
|------------------|--------------|--------------|-------|-------------|------|-------|
| | | | | 3 | | |
| N 0 | | 110 | | o . | | |
| h | | | | 7 | | (|
| N N N N | | 120 | | N. O | | (|
| 230 | | 130 | | ۵. ۵. | | |
| | | | | | | (|
| 240 | | 140 | | ò | | |
| N | | <u></u> | | (h O | | |
| 250 | | 150 | | 0 | | |
| 260 | | 160 | | 0 | | |
| | | | | | | |
| | | 170 | | 70 | | |
| | | 380 | | 8 2. | | |
| | | 0 | | | | |
| | | 190 | | 90 | | |
| | | N 0- 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 | 4 0.02 | 40,01 | A .02 | 40.2 | △0.02 | △0.02 | | | |
| | δ | පි | Ω | င္တ | දි | ర్జ | Ω | | | |
| | 40.02 | 40.02 |) | 40.02 | 40.02 | 40,2 | △0.02 | | | |
| | Æ | ဥ | වූ | ନ୍ଥ | 멸 | 녆 | Dy | 80 | | |
| | 40.02 | 40.02 | 40.02 | <0.02 | 40.02 | 40.02 | 40.02 | mineral differences | | |
| | 3 | Ľ | स्र | Ħ | ď | ᅜ | Ж | Sheriff tool | | |
| | ⊕ .02 | 40.02 | 40.2 | A).02 | <0.02 | 40.02 | 40.02 | | I race M | 1 |
| | 폺 | Мо | В. | Ķ | ВМ | Ē | П | MISSON ISSUE | Metals | 1 |
| 3 | 40.02 | 40.02 | 40.2 | 40.02 | 40,01 | ∆ .02 | 40.02 | SI RECEIPTOR | Verification | |
| Towns and the | ~ | ን | 70 | 굕 | ô | ₹ | 3 | SHEWNING. | Clon | - |
| | ∆ 0.2 | 40.02 | 40.02 | 40,02 | 40.02 | 40.02 | 40.02 | THE PARTY OF THE P | by ICP-M | |
| | Sc | Sm | 잗 | 공 | Rh | æ | Pr | | S (Hi | 5 |
| | <0.02 | <0.02 | <0.02 | 40.02 | 40,02 | 40.02 | <0.02 | | g/mL) | |
| | Ta | S | ñ | Z. | Ą | Si. | Se | | | |
| | 40.02 | <0.02 | 40.02 | 402 | 40.02 | 40.02 | 402 | | | |
| | == | Sn | Tm | 3 | ᄇ | 급 | 176 | | | |
| | 40,02 | 40.02 | 40,02 | 40,02 | <0.02 | 40,02 | <0.02 | Contract Contraction | | |
| | Z | Zn | ~ | 뀱 | ۷ | Ϥ | W | 可能を発展 | | |
| | <0.02 | < 0.02 | <0.02 | <0.02 | 40.02 | 40.02 | <0.02 | SALES OF STREET | | |

(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).

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

Certified Reference Material CRM

R: 10/23/23 M5697



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



| CERTIFIED WEIGHT REPORT | | | | | | Lot # | Solvent: | | | | | | |
|---|------------|---------------------|----------|-----------|---------------------|--------------|--|---------------|---|------------|--|-------------------|------|
| Part Number: Lot Number: | | 58029 102523 | | | | 24002546 | Nitric Acid | | 111111111111111111111111111111111111111 | | (| | |
| Description: | | Copper (Cu) | ব্র | | | | | | | 7 | Common Co | | |
| | | | | | | 2.0% | 40.0 | Nitric Acid F | Formulated By: | | Benson Chan | 102523 | |
| Expiration Date: | ** | 102526 | | | | | (mľ) | | \ | 7 | 6 | | |
| Recommended Storage: | ** | Ambient (20 °C) | (၃ | | | | | | 1 | K | No. | | |
| Nominal Concentration (µg/mL): | <u></u> | 1000 | | | | | | | Lan | do de | Crear | | |
| NIST Test Number: | | 6UTB | | 5E-05 | Balance Uncertainty | rıly | | | Reviewed By: | | Pedro L. Rentas | 102523 | |
| Volume shown below was diluted to (mL): | was dilute | d to (mL): | 200002 | 0.058 | Flask Uncertainty | | | ı | | | | | |
| | | | | | | | | | Expanded | | SDS Information | uc | |
| | Part | Ę | Dilution | Initial | Uncertainty | Nominal | Initial | Final | Uncertainty | (Solver | (Solvent Safety Info. On Attached pg.) | tached pg.) | NIST |
| Compound | Number | Number | Factor | Vol. (mL) | Pipette (mL) C | onc. (µg/mL) | Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) | | +/- (ng/mL) | CAS# (| OSHA PEL (TWA) | LD50 | SRM |
| Copper(II) nitrate trihvdrate (Cu) | 58129 | 58129 100223 0.1000 | 0.1000 | 200.0 | 0.084 | 1000 | 10000.1 | 1000.0 | 2.2 | 10031-43-3 | 1 ma/m3 | ori-rat 794 mo/kg | 3114 |
| , | | | | ш | | | | | | 200 | l | | |
| | | | | | | | | | | | | | |

| 1.0E6 | [1] Spectrum No.1 | L'ON ED | | 422 sec]:5 | [33.422 sec]:58029.D# [Count] [Linear] | Sound (Lir | near] | 1000 | | | | |
|----------------|-------------------|---------|-----|------------|---|------------|-------|------|-------|-----|----|--|
| 5.0E5 | (A) | | | | | | | | | | | |
| m/z-> | | 0 | O | OE | 04 | 20 | 9 | , v | O C | 06 | 00 | |
| 2.5E7 | | | | | | | | | | | | |
| m/z-> 2.0E7 | 0 | | 120 | 130 | 041 | 150 | 160 | 170 | 000 r | 190 | 00 | |
| 1.067 | | | | | | | | | | | | |
| <-Z/L | 210 | | 220 | 230 | 240 | 250 | 860 | | | | | |

Printed: 10/26/2023, 1:20:31 PM

Absolute Standards, Inc.

www.absolutestandards.com 300-368-1131





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

Certified Reference Material CRM

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

| ification by ICP-MS (µg/mL) | <0.02 Pr <0.02 Se <0.2 Tb <0.02 W | Nb <0.02 Re <0.02 Si <0.02 Te <0.02 U <0.02 | <0.02 Rb <0.02 Ag <0.02 T1 <0.02 V | 40.02 Rb 40.02 Na 40.2 Th 40.02 Yb | <0.02 Ru <0.02 Sr <0.02 Tm <0.02 Y | <0.02 Sm <0.02 S <0.02 Sn <0.02 Zn | 40.2 Sc 40.02 Ta 40.02 Ti 40.02 Zr |
|--|---|---|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Trace | L | (o <0.02 | _ | r <0.02 | | _ | Ì |
| | | Ho | | - | 윤 | ۳. | £. |
| | <0.02 | 40.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| - Control | Ď | ŭ | <u>ᇳ</u> | ন্ত — | <u>5</u> | පී | Αn |
| | <0.02 | <0.7 | <0.02 | <0.02 | <0.02 | <0.02 | Į- |
| | 3 | ರೆ | ಲೆ — | <u>ರ</u> | <u></u> | රි | ਟੌ |
| | <0.02 | 40.02 | 40.2 | <0.02 | 10.0> | <0.02 | <0.02 |
| A STATE OF THE PARTY OF THE PAR | V | SP P | As | Ba | æ | Ä | В |

(T) = Target 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).

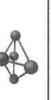
Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

* 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).

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

Certified Reference Material CRM

A: 10/23/23 4 M5698



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

| Part Number: 58025 Lot Number: 102623 Description: Manganese (Mn) Expiration Date: 102626 Recommended Storage: Ambient (20 °C) Nominal Concentration (ug/mL): 1000 | | 240 | 24002546 | CALL A LILE | | | | | |
|---|---------------|--|------------|--------------|---------------|--|--|----------|------|
| Almoi A A | | | | NITIC ACID | | | | | |
| | | | | | | The state of the s | | | |
| | | | | | | Charles Con | The second secon | | |
| | | CV. | 2.0% | 0.09 | Nitric Acid | Formulated By: | Benson Chan | 102623 | |
| | | | | (mF) | | 1 | 6 | | |
| | | | | | | 1 | The state of the s | | |
| | | | | | | Learen | Kera | | |
| NIST Test Number: 6UTB 5E- | 5E-05 Ball | Balance Uncertainty | | | | Reviewed By: | Pedro L. Rentas | 102623 | |
| Volume shown below was diluted to (mL): 3000.41 0.0 | 0.058 FIR | Flask Uncertainty | | | , | | | | |
| | | | | | | Expanded | SDS Information | | |
| Part Lot Dilution Initi | Initial | Uncertainty No | Nominal | Initial | Final | Uncertainty | (Solvent Safety Info. On Attached pg.) | hed pg.) | NIST |
| Compound Number Number Factor Vol. (| Vol. (mL) Pip | Pipette (mL) Conc. (μg/mL) Conc. (μg/mL) Conc. (μg/mL) +/- (μg/mL) | (/m/b/n) C | onc. (ug/mL) | Conc. (ug/mL) | | CAS# OSHA PEL (TWA) | LD50 | SRM |

orl-rat >300mg/kg 3132

5 mg/m3

20694-39-7

2.1

1000.0

100001

0001

0.084

300.0

0.1000

071123

1. Manganese(II) nitrate tetrahydrate (Mn) 58125

Part # 58025

1 of 2



Certified Reference Material CRM

Absolute Standards, Inc.

www.absolutestandards.com

300-368-1131

ANAB ISO 17034 Accredited AR-1539 Certificate Number

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

| | | | | | | | Trace M | letals | Verification | tion | by ICP-I | 4S (µg | J/mL) | | | | | | |
|---------|-------|----------|---------------|-----------|------------------|----------------|--|------------|--------------|----------------|-----------------|--------|-----------------|-----------------|----------------|-----------|-------|----|--|
| | | SILVE OF | CANCEL CANCEL | THE STATE | SCHOOLS NAMED IN | No. | SPECIFICATION OF THE PARTY OF T | THE STREET | SHAMMAN | SAMPLE SERVICE | Resident Avenue | W-1000 | Applications of | SECTION SECTION | STATE STATE OF | Section 2 | | | Control of the Contro |
| IA I | <0.02 | පි | <0.02 | ፭ | <0.02 | HŁ | <0.02 | 3 | <0.02 | ž | <0.02 | 뇬 | <0.02 | S | <0.2 | -01. | <0.02 | 3 | <0.02 |
| & | <0.02 | రో | <0.2 | 西 | <0.02 | Ho | 20.0≥ | ڐ | ₹0.02 | £ | ₹0.02 | 2 | <0.02 | Si | <0.02 | Te | <0.02 | ם | <0.02 |
| As | 40.2 | ೮ | <0.02 | 超 | <0.02 | ų | <0.02 | Mg | <0.01 | ő | <0.02 | 2 | <0.02 | Ag | <0.02 | F | <0.02 | > | 40.02 |
| Ba | <0.02 | ర | <0.02 | 3 | <0.02 | H | <0.02 | Mp | H | Pg | <0.02 | R6 | <0.02 | R. | 40.2 | F | <0.02 | χp | ₹0.02 |
| Be | 40.01 | ඊ | <0.02 | Ö | 40.02 | 굕 | 40.2 | Hg | <0.7 | ۵, | <0.02 | Ru | <0.02 | Ş | <0.02 | 뎚 | <0.02 | × | <0.02 |
| Bi | 40.02 | රි | <0.02 | පි | <0.02 | r _a | <0.02 | Mo | 20:0> | Δ, | <0.02 | Sm | <0.02 | S | ₹0.02 | Sn | <0.02 | Zn | <0.02 |
| В | <0.02 | đ | <0.02 | Αu | <0.02 | Pb | <0.02 | PN | <0.02 | × | <0.2 | Sc | <0.02 | 턴 | <0.02 | F | <0.02 | 77 | 40.02 |
| | | | | | | | | | | | | | | | | | | | |

(T) = Target analyte

Physical Characterization:

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

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

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM MSTHT

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

CERTIFIED WEIGHT REPORT: R: 12/20/23

Solvent: 24002546 Lot # Nitric Acid

Part Number: **Lot Number:** Description:

57082 100923 Lead (Pb)

Ambient (20 °C) 2% 60.0 Nitric Acid

Formulated By:

Lawrence Barry

100923

Nominal Concentration (µg/mL): 1000

Recommended Storage:

Expiration Date:

100926

| Lot | Weight shown below was diluted to (mL) | NIST Test Number: 6UTB | 1 1 |
|--|--|---------------------------|-----|
| | 0.0 | B | |
| Nominal Pu | 3000.41 | | |
| Purity | 0.06 | 5E-05 | |
| Purity Uncertainty Assay | 3000.41 0.06 Flask Uncertainty | 5E-05 Balance Uncertainty | |
| Target | | | |
| Actual | | | |
| Actual | | | |
| Expanded Uncertainty | | Reviewed By: | 83 |
| SDS Information (Solvent Safety Info. On Attached pg | | Pedro L. Rentas | |
| 1 pg.) | | 100923 | |
| _ | | | |

| | .÷ 7 [ਛੂ | S | | |
|-------------------|---------------------------|--|--|--|
| 1.0E5 | 1. Lead(II) nitrate (Pb) | mpound | | |
| [1] Spectrum No.1 | N | 72 | | |
| NO.1 | IN029 PBD122016A1 | Lot M# Number | | |
| [14.144 | A1 1000 | Lot Nominal Purity Uncertainty RM# Number Conc. (µg/mL) (%) Purity (%) | | |
| 9ec]:5 | 99.999 | Purity nL) (%) | | |
| 8082.D | 0.10 | Nominal Purity Uncertainty Assay | | |
| # [Cot | 62.5 | (%) | | |
| ut] [Line | 4.80071 | Target Weight (g) | | |
| arj | 0.10 62.5 4.80071 4.80077 | Actual Weight (g) | | |
| | 1000.0 | | | |
| | 11 | Actual Uncertainty nc. (µg/mL) +/- (µg/mL) C | | |
| | 10099-74-8 | (Solv | | |
| | 2.0 10099-74-8 0.05 mg/m3 | Actual Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 | | |
| | intryns-rat 83 mg/kg 3128 | ttached pg.) LD50 | | |
| | 3128 | NIST | | |

| m/z-> | 1.0E6 | 20.00 10.00 | m/z-> | 5,0日4 | 1.0E5 | m/z-> | 5.0E4 | 1.0巨5 |
|-------|-------|---|-------|-------|-------|-------|-------|-------|
| 1 | | | | | | ú | | |
| No. | | | 110 | | | ō | | |
| | | | | | | 1 | | |
| Š | | | 120 | | | 0 | | |
| 3 | | | | | | () | | |
| | | | 130 | | | 90 | | |
| 1 | | | 140 | | | 40 | | |
| 4 | | | 0 | | | | | |
| | | | 150 | | | G O | | |
| | | | | | | | | |
| | | | 180 | | | 00 | | |
| | | | 4 | | | J | | |
| | | | 170 | | | 70 | | |
| | | | 180 | | | 80 | | |
| | | | | | | | | |
| | | | 190 | | | 90 | | |
| | | | N | | | 4 | | |
| | | | 200 | | | 8 | | |

Part # 57082



| r | | <u>.</u> | | _ | | | _ | | The second second | | |
|-------|---------------|--------------|--------------|--------------|---------------|--------------|-------|--------|--|----------|---|
| 20.00 | 3 8 | A 65 | <u>&</u> | A.02 | 7.0 | 2 2 | 3 | A.02 | | | |
| 1 | ? { | 3 1 | <u>Ω</u> | င္တ | E | 5 | 3 | 2 | | | |
| 20.02 | 3 8 | 3 8 | 8 | ∆0,02 | 20.02 | 200 | 3 | 40,02 | | | |
| Au | 6 | 9 6 | 3 | වී | Eu | ļ ļ | j į | Dγ | | | |
| 20,02 | 20.02 | 3 6 | 3 | 40.02 | <0.02 | 20.02 | | A) (72 | MASSESSION STATES | | |
| 3 | ! <u>[</u> | 1 6 | FI I | Ħ' | Þ, | Но | : | Ħ | | | |
| l i | 20.02 | 3 6 | 3 | 40.02 | <0.02 | 40,02 | 20.00 | AN OP | | гасе ме | |
| Ä | MO | 100 | f | <u></u> | Mg | Ē | į | | | Tals | - |
| 40.02 | 20.02 | 8 | | △ | 40.01 | <0.02 | 10.02 | 200 | | Verifica | |
| K | 7 | , - | ; ; | Ā. | ွှ | \$ | 2 | | | tion | |
| 40.2 | <0.02 | 20.02 | 2000 | 3 | 40.02 | 40,02 | 20.02 | 200 | ŀ | by ICP-I | |
| Sc | Sm | K | , § | 9 | 꾿 | Re | T | | I. | S | |
| <0.02 | 40.02 | <0.02 | 20.02 | 3 | 40.02 | 40.02 | 20.02 | 200 | ŀ | ra/mL) | |
| Ta | S | Sr | INE | , d | A | S: | ĕ | | I | | ı |
| 40.02 | 40.02 | 40.02 | 402 | 3 | 40.02 | 40.02 | 202 | | | | |
| 11 | Sh | Tm | I | 1 | = | Te | 5 | | | | |
| 40.02 | ∆ 0.02 | 40.02 | 20.02 | | AD 072 | ∆ .02 | 40.02 | | - | | |
| Z | Zn | × | Ϋ́O | į . | < | d | × | | | | |
| 40.02 | 40.02 | 40.02 | 40.02 | 50.02 | A 03 | ₩ | 40.02 | | STREET, SQUARE, SQUARE | | |

Physical Characterization:

(1)= 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
- * All standard containers are meticulously cleaned prior to use.

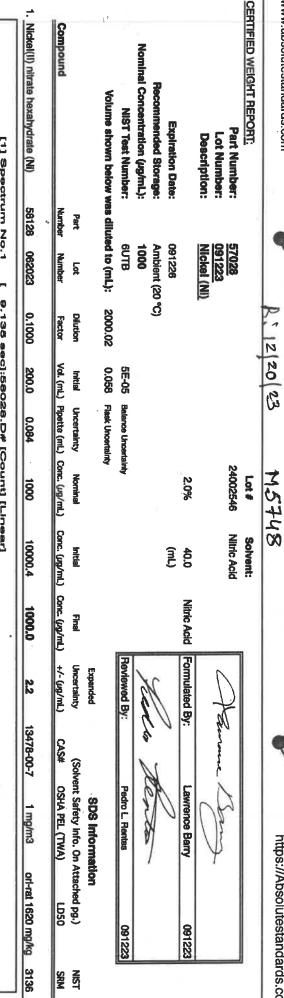
the preparation of all standards.

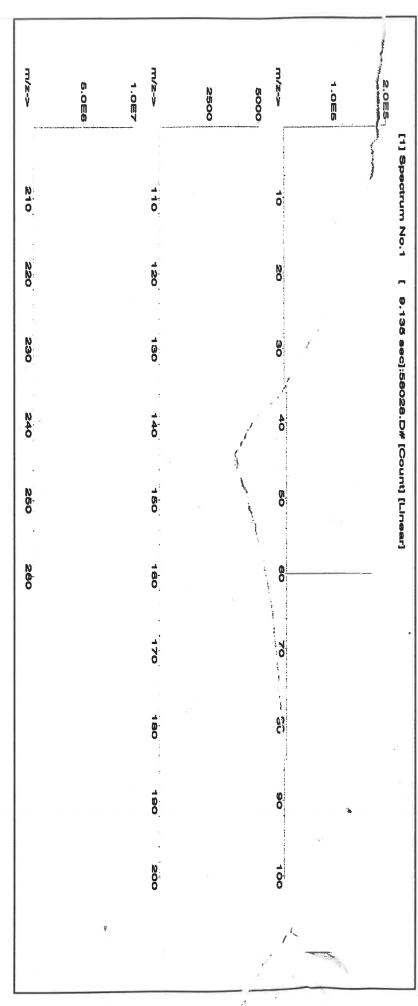
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
- * 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).

Certified Reference Material CRM



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





800-368-1131

Absolute Standards, Inc.

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

| | 1 | - | | - | - | | - | - | | - | - | | 7 | | - |
|----------|-------|---------------|--------------|---------------|-------------|--------------|----------|--------------|--------------|-------|--|-----------------|----------|--|---|
| | | В | 10 | <u> </u> | Be | Ва | 1 | As | 30 | 3 | 2 | | | | |
| | | 40.02 | 2000 | 5 | <u>8</u> | 40,02 | | 40.2 | 70.02 | | 40.02 | | | | |
| | | ව | S | · · | 2 | సి | . 8 | څ - | 2 | , | 2 | | | | |
| | | D.02 | 40.02 | | 48 | 6 .02 | 20.00 | 3 | 4 0.2 | 000 | A)R) | | | | |
| | | Αu | ڇ | Ş | ₽ - | ይ | 2 | ľ | Ę | 5 | 7 | | | | |
| | | ∆ 002 | <0,02 | 20.02 | 3 | A)02 | 20,02 | 3 | A),02 | 70.02 | 2000 | | | | |
| | | 3 | 7 | 17 | <u>F</u> | F | ħ | 7 | 뚱 | 12 | W. | Service Service | | | |
| | | ∆ 0.02 | 0.02 | , C | 3 | <u> </u> | 20.02 | 3 | <u>&</u> | 20.02 | 2000 | | Hace in | | |
| | | Z. | ₹ | 200 | 7 | š | 3 | | Ε. | ţ. | | | Jergis | 1 | |
| 3 | | A | & 20.02 | 4 | 6.02 | \$ | <u>A</u> | | A (2) | 20.02 | | | ARIIIC | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | |
| Target | r | 7 | 7 | re | , ; | Z | S | , ; | <u> </u> | 2 | ۱ | | HODE | | |
| arialvie | 1.07 | 3 | A | 40.02 | 20.02 | 3 | 40.02 | 2000 | 3 | Н | | | DY ICE-P | | |
| | ۶ | 9 - | î | R | 2 | ğ | Z | 7 | 9 | 7 | | | ₹ E | , | |
| • | 20.02 | 3 6 | A 3 | ∆ 0.02 | 20.02 | 3 | A | 70.02 | 3 | ۵.02 | | ľ | | | |
| | I a | 3 6 | ^ | ş | N | 1 6 | Αg | 2 | ? | જ | The same | | | | |
| | 20,02 | 68 | 3 | <u>&</u> | 8 | | ≙ | 20.02 | 3 | 40.2 | A STATE OF THE STA | | | | |
| | | 1 1 | ? | ď | П | : | -1 | ie. | 3 | 7 | | | | | |
| | 40,02 | 20.02 | 3 | 40.02 | 40.02 | 6.06 | 3 | 20.02 | 100 | 4000 | | | | | |
| | 72 | 4 | ₹, | <u> </u> | 5 | - | < | _ | : : | W | Mannager, or | | | | |
| | <0.02 | 20.02 | 600 | 3 | 6002 | 20.02 | 3 | ∆ .02 | 200 | 200 | | | | | |

Physical Characterization:

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

Certified by:

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



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 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



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 | ∆0.2 | <0.02 | <0.02 | | |
| | Ĉ. | ဝ | Ω | Ŝ | ද | ದ್ | Ω | | |
| | ∆ 0.02 | <0.02 | <0.02 | <0.02 | 40.02 | 40.2 | <0.02 | | |
| | Αu | ရွာ | က္အ | 8 | 탇 | 耳 | Dy | | |
| | ₹0,02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | |
| | 73 | Ľ. | Fe | F | In I | 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 | ⊷] | <0.02 | <0.02 | Verifica | No. |
| | × | 7. | Р | Pd | S _O | Ş | Z | | |
| | 40.2 | 40.02 | 40.02 | 40.02 | <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).



Certified Reference Material CRM



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

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

24002546 Nitric Acid

2.0% (IE)

Nominal Concentration (µg/mL):

NIST Test Number:

BTU₉ 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 | Verifical | cation | by ICP-M | 1) SI | ua/mL) | | | | | | |
|----|-----------|----|------------------|-------------|--------------|---|---------|-----------------|------------------|--|-----------------|------------------------|--------------|----|-------|-----|-------|--|--------------|
| | THE STATE | | PENNINE BUILDING | AUTHORNSON. | | | | STREET, STREET, | SERVICE SECURITY | SECTION SECTIO | HENCON BUILDING | NAME OF TAXABLE PARTY. | . ш | | | | | A STATE OF THE PARTY OF THE PAR | |
| ΙΥ | <0.02 | 3 | <0.02 | δ | <0.02 | H | <0.02 | Ľ | <0.02 | ž | <0.02 | 左 | <0.02 | Se | <0.2 | 176 | <0.02 | M | <0.02 |
| Sp | <0.02 | J | 40.2 | à | 40.02 | Н | <0.02 | 3 | <0.02 | £ | <0.02 | Re | <0.02 | š | <0.02 | ę | ₹0.02 | ם | 40.02 |
| As | 407 | ඊ | <0.02 | 립 | ₹0.02 | ជ | <0.02 | Mg | <0.01 | ő | <0.02 | 묎 | <0.05 | Ag | <0.02 | F | <0.02 | > | <0.02 |
| Ba | <0.02 | ర | <0.02 | 3 | <0.02 | ㅂ | ₹0.02 | Mn | <0.02 | Z | ₹0.05 | 8 | <0.02 | ğ | 40.2 | Ħ | <0.02 | Ą. | <0.02 |
| å | Т | Ö | <0.02 | 5 | 40.02 | £ | <0.7 | Hg | <0.2 | Δ, | <0.02 | Ru | 40.02 | Ş | <0.02 | Tm | ₹0.02 | > | <0.02 |
| Ä | <0.02 | රි | <0.02 | පී | 40.02 | 2 | 40.02 | Mo | <0.02 | 盂 | 40.02 | Sm | 40.02 | S | <0.02 | S | <0.02 | 77 | <0.02 |
| æ | <0.02 | ರೆ | <0.02 | Αm | <0.02 | £ | 40.02 | PN | <0.02 | M | <0.2 | Sc | 40.02 | 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:



All standard containers are meticulously cleaned prior to use.

2 of 2

^{*} 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).

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).

122



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

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/III 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):

| | Bi Bi Bi | I |
|--------------------|---|----------|
| | | |
| | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | |
| | 58555 | |
| | 40.02 40.02 40.02 40.02 40.02 | |
| | AC CS EE DY | |
| | 444 444 444 444 444 444 444 444 444 44 | |
| | HH Ho Hr Fe La | |
| | 40.00 40.00 40.00 40.00 40.00 40.00 | Trace M |
| | Nd Min Li | letals |
| (T) = Tamet anshra | 40.02 40.02 40.02 40.02 | Verifica |
| angk | * 7 ~ 8 S 4 X | Ition |
| 4 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | by ICP-I |
| | S R R R R | m) S |
| | 4444 | a/mL) |
| | T _R S _r S _s S _s | |
| | 402 402 402 402 402 402 | |
| | T I I I I | |
| | 40.02 40.02 40.02 40.02 | |
| | Z Z ≺ Z < ⊂ € | |
| | 4 4 5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | |

(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

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:

| | | | | | | 100 | 10000 | CHICAGO CONTROL CONTRO | URCH LABILLY | ianioc) | (Solvent Safety Into, On Attached pg.) | ttacned pg.) | 22 |
|---|--------|--------|--------|-----------|----------------|--|---------------|--|--------------|------------|---|--|------|
| Compound | Number | Number | Factor | Vol. (mL) | Pipette (mL) (| 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 |
| | | | | | | | | | | | | | |
| Cobalt(II) nitrate hexahydrate (Co) 58127 050923 0,1000 200.0 | 58127 | 050923 | 0.1000 | | 0.084 | 1000 | 10000 | 100001 | 00 | 10008.00.0 | Company CO O | 200 | 0770 |
| | | | | | | | | 2000 | 1 | 0.770.001 | O.UZ IIIgiritis | STEE SOCIETY OF HIGHER OF HIGHER OF HIGHER OF HIGHER | 3113 |
| (| | | | 2 | | | | | | | | | |
| | | | 0 770 | | LA SPOLL NO | LOS ESTADOS NO CONTRACTOR SECTION TO CONTRAC | F 1 | | | | | | |

| 1.056 | 5.0E5 | m/z-> | 5.0E7 | 1.0E8 | 5.0E7 |
|---|-------|------------|-------|-------|-------|
| | | | | | |
| | | 0 | | 0 | |
| | | 0 | | 120 | |
| L 34-243 Secj.baok7.D# [Count] [Linear] | | Ō | | 130 | |
| | | .0 | | 140 | |
| | | .09 | | 50 | |
| | | . O | | 160 | |
| | | | | 170 | |
| | | 02 | | | |
| | | 80 | | 160 | |
| | | 00 | | 081 | |
| | | 001 | | 500 | |

Lot # 091923

250

240

230

220

010

W/Z->

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 M | etals | Verifical | tion | by ICP-M | 4S (F | g/mL) | | | | | | |
|----|---------------|----|---------------|-----|----------------|----|--|------------------|---|--------|---------------|---------|---------------|------------------------|---------------------|----------------|-------|-----|-------------------|
| 1 | | | | | | | STREET, STREET | No section lives | ALL DESCRIPTION OF THE PERSON | 10.000 | Market Mark | MINNSH. | Sanday Marine | NAME OF TAXABLE PARTY. | Service of the last | SECOND SECOND | | No. | A STATE OF STREET |
| 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 | M | <0.02 |
| ౙ | 40.02 | రే | 40 7 | 占 | <0.02 | H9 | <0.02 | .3 | ₹005 | Ź | ₹0.02 | 2 | <0.02 | Š | 40.02 | T _e | 40.05 | 5 | 40.02 |
| As | 40.2 | ප | 40.02 | 呂 | 40.02 | ų | <0.02 | Mg | 10.05 | ő | ₹0.02 | 됩 | <0.02 | Ag | 40.02 | F | <0.02 | > | ₩ 40.02 |
| 쯃 | 40.02 | చ | 40.02 | 3 | 4002 | ㅂ | <0.02 | Ma | <0.02 | 콘 | ₹000 | 2 | 40.02 | N _a | 40.2 | Ę | 20:0> | g, | Ø.02 |
| 2 | 10.05 | ඊ | 20.0 2 | త్ర | 40.02 | હ | 40.2 | 쁀 | \$ 20 | تم | ₹0.02 | 콥 | <0.02 | Şt | 40.02 | Tm | Ø.02 | ٨ | Ø.02 |
| 遥 | 40 .02 | රි | ۳ | Ğ, | 4002 | ដ | <0.02 | Mo | 40.02 | Æ | 20'0 > | S | <0.02 | S | 40.02 | 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 | ₩ | Fee Fee | 40,02 | Ħ | Ø.02 | Z | Ø.02 |

(T)= Target 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.



Lot # 091923

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

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 2.0日5 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 4002 4002 4002 4002 | | |
| | 5 8 ជ ង 8 ជ ប | | |
| | 402 402 402 402 402 402 | | |
| | ₹ ७८८ = = ⊅ | | |
| | 6000 6000 6000 6000 | | |
| | 322428 | | |
| | 40.02 40.02 40.02 40.02 40.02 | Trace N | |
| | N H M L L | letals | |
| 9 | 40.2 40.2 40.2 40.2 40.2 | Verifica | |
| = Target | M R P B O R R | E S S | |
| Target analyte | 40.02 40.02 40.02 40.02 | by ICP-N | |
| | S R R R R R | id) St | |
| R | 4444 444 444 444 444 444 444 444 444 4 | g/mL) | |
| | Ta Sr Na Sc | | |
| | 40.2 40.2 40.2 40.2 40.2 40.2 | | |
| | ###################################### | | |
| (e) | 40.02 40.02 40.02 40.02 40.02 40.02 | | |
| | Z Z Y Z < C & | | |
| | 40.02 40.02 40.02 40.02 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
- 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 # 57033

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

Solvent: MKBQ8597V Ammonium hydroxide

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

CERTIFIED WEIGHT REPORT: R - 02 00 124 M.5814

Part Number: Lot Number: 57005 071123

Description: Boron (B)

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

Expiration Date:

071126

2.0%

Ammonium hydroxide

Formulated By:

Benson Chan

071123

tento

40.0

Weight shown below was diluted to (mL): 1999.48 0.058 Flask Uncertainty

RM#

Number

Purity (%)

3

NIST Test Number: Ĕ Nominal Purity 5E-05 Balance Uncertainty Uncertainty Assay Target Actual Reviewed By: Expanded Pedro L. Rentas **SDS Information**

071123

1. Boric acid (B) IN018 BV092016A1 Conc. (µg/mL) 9 8 0.10 17.3 11.55772 Weight (g) 11.56201 1000.4 120 10043-35-3 2 mg/m3 orl-rat 2660 mg/kg 3107

Actual +/- (µg/mL) Uncertainty CAS# (Solvent Safety Info. On Attached pg.)
OSHA PEL (TWA) LD50 OSHA PEL (TWA)

NIST SRM

Weight (g) Conc. (µg/mL)

[1] Spectrum No.1 [12.275 sec]:58105.D# [Count] [Linear]

17/Z-V <-Z/111 m/z-> 2.5EG 5.0E6 2.5E6 S.OE6 1.0E4 2.0≡4 110 1210 0 120 220 Ŋ 130 230 30 140 240 40 150 250 (I) O 200 160 60 170 70

180

190

200

80

90

100

Part # 57005

Printed: 2/8/2024, 5:01:07 PM

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

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

| | B B B B B | | |
|--|---|----------|--|
| | 40.02 40.02 40.02 40.02 40.02 | | |
| | 58 ៦ ៦ ៦ ៦ ៦ | | |
| | 40.02 40.02 40.02 40.02 40.02 40.02 | | |
| | A C C C E E Dy | | |
| | 40.02 40.02 40.02 40.02 | | |
| | 322442 | ١. | |
| | 402 402 402 402 402 | Trace M | |
| | Hg Mh | etals | |
| (T) = Target analyte | 40.02 40.02 40.02 40.02 | Verifica | |
| get ans | z z o z o z z | ation | |
| alyte | 40.02 40.02 40.02 40.02 40.02 40.02 | by ICP | |
| | S R R R R R | -MS (| |
| | 666666666666666666666666666666666666666 | //g/mL) | |
| | Ta S Na Ag | | |
| | 40.02 40.02 40.02 40.02 40.02 40.02 | | |
| | T I I I I | | |
| | 4444 4422 4422 4422 4422 4422 4422 442 | | |
| | \$ 2 × \$ × C \$ | | |
| | 4000 4000 4000 4000 | | |

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

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):

| | Г | | | | | | , . | 1 | Г | ĺ |
|---------------|----------------|--------------|----------------|---------------|---------------|--------------|---------------|--|----------|------------|
| | F | 3 <u>5</u> | i Re | , 00 | AS | - 20 | ≠ ≥ | | | |
| | 20.02 | 20.02 | 10.0 | A0.02 | 8 | 20.02 | A0.02 | | | |
| | 3 | , Ç | , 5 | ဂ္ဂ | Ç | . E | 8 | | | |
| | A0,02 | 40.02 | A)02 | 0.02 | 6 002 | 40.2 | A 0.02 | COLUMN DESCRIPTION | | |
| | Æ | ှင့ | ନ୍ଥ | 5 | 먑 | Ē | Ş | | | |
| | A0.02 | A.02 | A).02 | 40.02 | 40.02 | A0.02 | 40.02 | | | |
| | 3 | 7 | 뀲 | 뱌 | Ħ | 퓽 | H | Ì | | |
| | ₫ ,022 | 40,02 | 6 2 | 40,02 | 40.02 | 40.02 | 40.02 | | race Me | |
| | ¥ | Мо | Hg | Mn | Mg | Ţ | Ľ | | letals | |
| Towns and the | 40.02 | 40,02 | 402 | 40.02 | 40.01 | 40.02 | <0.02 | | Verifica | |
| | × | 'n | ۳ | ਣ | Š | ¥ | Z | į | tion | |
| | A | 40,02 | T | 40,02 | 40.02 | 40.02 | 40,02 | | by ICP-A | |
| | Sc | Sm | R _L | R. | æ | æ | 27 | ı, | E SI | |
| | 40.02 | 40.02 | 40.02 | 40.02 | 40.02 | A0.02 | 40.02 | ľ | | The second |
| | T _B | S | Ş | Z | ≱ | S | & | | | |
| | 40.02 | ∆ .02 | 6.02 | <u>\$</u> | ∆ 0,02 | 40.02 | 40.2 | | | |
| | 17 | Sp | Tm | 닭 | ㅂ | Te | T T | | | |
| | <0.02 | <0.02 | <0.02 | ∆ 0.02 | 40.02 | 40,02 | 40,02 | STREET, STREET | | |
| | Zr | Zn | ₩. | \$ | < | □ | W | | | |
| | <0.02 | 6002 | A).02 | A0.02 | & .02 .03 | 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 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-> 2.0E5 | 2.565 | 5.0E5 | 1000 | 2000 |
|-------------|-------|----------------|-------|------------|------|------|
| | | | | | | |
| 0 | | 110 | | 0 | | |
| N N O | | 120 | | 20 | | |
| 230 | | 30 | | 9 0 | | |
| 240 | | 140 | | 40 | | |
| 250 | | 150 | | 50 | | |
| 260 | | 160 | | 8 | | |
| | | 170 | | 70 | | |
| | | 180 | | 8. | | |
| | | 190 | | 90 | | |
| | | 200 | | 100 | | |

Part # 57116

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

| | B B B B As Al | |
|---------------------|--|----------|
| | 40.02 40.02 40.02 40.02 | |
| • | 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | |
| | 5848888 | |
| 1 | 40.2 40.2 40.02 40.02 | |
| | A C C C C C C C C C C C C C C C C C C C | |
| | 40.02 40.02 40.02 40.02 40.02 40.02 | |
| | # # # # # # # # # # # # # # # # # # # | _ |
| | 40.02 40.02 40.02 40.02 40.02 | Trace Ma |
| | Ma Ma Ma Ma | 200 |
| (T)= Tarnet analyte | 40.02 40.02 40.02 40.02 40.02 | Variety. |
| hansh | K B B B B B B B B B B B B B B B B B B B | |
| Ď | 402 402 402 402 402 | |
| | | |
| | 4002 4002 4002 4002 4002 4002 4002 | |
| | S S S S S | |
| | 40.2 40.02 40.02 40.02 40.02 T | |
| | T I I I I | |
| | 4000 4000 4000 4000 4000 | |
| | 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

www.absolutestandards.com



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 |

| | ш | | | | | | | | | | | | |
|-----|---------------|---|---------|-------------|---------------|------------|------------|-------|-------------|-------|--|-------------|----------------|
| SRM | LD50 | NM# NUMBER CORC. (AS/ML) (%) PURITY (%) (%) Weight (g) Conc. (AS/ML) +/- (AS/ML) CAS/M OSHA PEL (TWA) | CAS# | +/- (wg/mL) | Conc. (µg/mL) | Weight (g) | Weight (g) | (%) | Punty (%) | (%) | Conc. (Jug/mL) | Numm Number | and the second |
| | | | | | | | | | | | 2 | Division Ni | |
| Z | Attached pg.) | Uncertainty (Solvent Safety Info. On Attached pg.) | (Solver | Uncertainty | Actual | Actual | Target | Assay | Uncertainty | Punty | Nominal Funty Uncertainty Assay Target | Lot | • |
| | | | | | | | | | | | | | |

| NNC CCC (AM1) TO COMPANY OF THE PROPERTY OF TH | ¥ | 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 |
|--|--------|------------------|------------------|----------------|-------------|--------------------|--------------|-----------|------|------|--------|------|-------------------|---|
| Manual Asset (IMA) | | | | | | | | | | | | | | |
| | SINING | Thore | עסווס דבר (1117) | C-1077 | Tr Wall the | Course (Page 1112) | /B) militari | 12) miles | | | | 400 | | |

| 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-> | 5.0E5 | m/z-> | 1.0E6 | 2.0E6 | 2500 | 5000 |
|---------|-------|-------------|-------|------------|------|------|
| | | | | | | |
| 210 | | 1 | | ö. | | |
| N | | | | | | |
| 220 | | 200 | | N. | | |
| 230 | | 130 | | G . | | |
| = | | | | | | |
| 0 40 | | 140 | | 4 | | |
| N | | | | | | |
| 250 | | 1 0 | | Ø. | | |
| 200 | | 100 | | 0 | | |
| | | | | | | |
| | | 170 | | 7 | | |
| | | 1 80 | | Q. | | |
| | | ō | | 80 | | |
| | | 190 | | 0 | | |
| | | An a | | | | |
| | | 200 | | 100 | | |

Part # 57014

1 of 2



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

| Ţ. | 5 | <u>B</u> | ķ | 7 5 | # : | As | 30 | 2 | A | i | Ī | |
|------------------|----------|---------------|---------------|-------|--------|----------|---|-------|-----------------|--|----------|----|
| ŀ | _ | _ | _ | | | _ | _ | _ | | | | |
| 1000 | 3 | 40.02 | 10.05 | 20.0 | 3 1 | 8 | 20.02 | | 40.02 | The second second | | |
| 2 | ? | င္ပ | 5 | , Ç | 3 5 | <u>ئ</u> | C. | 1 | 2 | | | |
| 20.02 | 3 | ∆ 0.02 | <0.02 | 20.02 | 2 6 | 3 | 40.2 | 20.00 | 20.02 | the Control of the | | |
| 2 | | ക ക | G. | ğ | 2 5 | ਜੂ ਹ | Ħ | 5 | 7 | 2000 per 1003 | | |
| 20.02 | 3 | 8 | A0.02 | 40,02 | 20.02 | 3 | ∆ .02 | 20.02 | 2000 | | | |
| 5 | ! } | 5 | ë | h | ۱ ا | r' | 픙 | 11 | 40 | | | ٠ |
| 40.02 | 0.04 | A | 40.2 | 40.02 | 20.02 | 3 | ∆ .02 | 20.02 | 000 | SOMEON STREET, | ITACE M | , |
| Nd | 1010 | <u></u> | Нg | Mn | M | <u> </u> | Ē | E | | | verais | |
| 40,02 | 10.04 | 3 | 6 2 | 40.02 | 10:03 | 2 | 20,02 | 20.02 | | | Verinca | 11 |
| × | 2 | \$ | ٦ | Pd | ç | , | \$ | 2 | 1 | | HOD | |
| 40.2 | 20.02 | 3 | ∆.02 | 40,02 | 40.02 | | 8.00 | 20.02 | | ŀ | by ICP-I | |
| Sc | 300 | î | ₽ | R | 2 | ! | 7 | 7 | | ļ | E S | |
| 40.02 | 20.03 | 3 | ♦ 0.02 | 0,02 | 40.02 | | A | <0.02 | | ľ | g/mL) | |
| Ta | v | , | S. | Z | A A | | 2 | Se | | | | I |
| & .02 | 20.02 | 3 | 83.6 | 40.2 | 40.02 | | -1 | 40.2 | | - | | |
| Ħ | Sn | 9 | ď | ij | Ħ | , | 7 | 176 | | | | |
| 40,02 | 20.02 | | 20.02 | 40.02 | 40.02 | 20.02 | 3 | 40.02 | | The Real Property lies | | |
| Zr | 70 | , | <u> </u> | \$ | < | - | ======================================= | ¥ | | | | |
| ∆ 0.02 | 40.02 | 1010 | A | 40.02 | 40.02 | 10.02 | 3 | 40.02 | O LEVER PROCESS | | | |

(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).

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



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

<u>%</u> 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):

| | 표표 등 등 등 S 도 도 | Г | |
|----------------|---|-----------------|--|
| | 40.02 40.02 40.02 40.02 40.02 40.02 | | |
| | 585855 | | |
| | 40.02 40.02 40.02 40.02 40.02 | | |
| | A C C E E E Dy | | |
| | 00000000000000000000000000000000000000 | | |
| | 7 7 7 7 7 7 7 7 | | |
| | 40.02 40.02 40.02 40.02 40.02 | Trace Me | |
| | Mo H Mg L L. | letals | |
| Toward analyte | 40.02 40.02 40.02 40.02 40.02 40.02 | Verifica | |
| | * # # # # # # # # # # # # # # # # # # # | tion | |
| | 40.22 40.22 40.22 40.22 | by ICP- | |
| | × | SM | |
| | 44444 | ug/mL) | |
| | Ta S. Na Ag | | |
| | 40.02 40.02 40.02 40.02 | | |
| | ###################################### | | |
| | 4000 4000 4000 4000 4000 4000 4000 400 | | |
| 100 | 당당< | | |
| | 6 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:

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

the preparation of all standards.

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

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

^{*} All standards should be stored with caps tight and under appropriate laboratory conditions.

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

Absolute Standards, Inc. 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 | - 60 10 | 70.02 | 3 | 70 | | A | 2002 | 200 | | |
| ř. | | <u>ნ</u> | 8 | , | Ω | Ç | ? | g | | ვ. | 2 | 2 | | |
| | | A 68 | 20705 | 3 | A 20.02 | 20.02 | 3 | 40.02 | | 2 | 20,02 | 3 | | |
| | | A II | Ę | 1 | ට ව | 2 | 2 | 달 | 2 | Į, | Ų | | | |
| | | 3 | 40.02 | | 3 | ♦0.02 |) | 8 | 20.02 | 3 | ∆ .02 | | | |
| | | ÿ | <u>_</u> | | ₹1 | 4 | | <u> </u> | 0.0 | F . | H | 1 | | |
| | 2000 | 3 | <u> </u> | 4.4 | 3 | ∆ 02 | | 6 002 | 20.02 | 3 | 40.02 | - | | Trace M |
| | i de | ž | š | 200 | Ç | ¥ | 9 | X | Į, | • | 5 | | | <u>P</u> |
| 3 | 20,02 | 3 | <u>8</u> | 7.03 | 3 | ∆ 0,02 | 1000 | <u>^</u> | 40,02 | 2 | A 0,02 | | | Verifica |
| Target | ŀ | 4 | 7 | 7 | , | Z | Ş | Ş | S | | Z | | | †: |
| Target analyte | ê | 9 | A) | _ | | 8 | 10:04 | 3 | A0.02 | | A) (2) | | 3 | אי וכפרו |
| | Se. | • | S | ¥. | , | ₽ | 2 | P | ₽ | : | Ŗ | Manager Street | F | 100 |
| | 40.02 | | A 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 | ∆ 0,02 | i d | 3 | 20,02 | 3 | ∆ | ć | 3 | | | |
| | 111 | ě | ? | Ĭ'n | Ē | ; | Η | ! | 7 | č | | | | |
| | 40.02 | 70.02 | 3 | ∆0,02 | 2000 | 3 | ∆ 0.02 | 2 | 200 | 20.02 | 300 | | | |
| | Zr | 2 | 7 | <u>~</u> | 16 | \$ | \ - | | 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).

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



Certified Reference Material CRM

M5962 R! 06/14/24



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

| m/z-> | | i, | m/z-> | | 10 c | ÷ is | 1. Selenium (Se) | Compound | | < | | Nominal Co | Re | | | CERTIFIED WEIGHT REPORT | מדודודה שובום |
|-------|-------|-------|-------|-------|---------|---------------------------------------|--------------------|--------------------------------------|--|---|---------------------|--------------------------------|----------------------|----------------|-----------------------------|-------------------------|---------------|
| 210 | 1.008 | 2.008 | 110 | 1.008 | /z-> 10 | [1] Spectrum No.1 | | | | Volume shown below was diluted to (mL): | NIST Test Number: | Nominal Concentration (µg/mL): | Recommended Storage: | 1 | Lot Number: Description: | Part Number: | 1 11000H |
| 0 | | | 0 | | Ū | Z | 58134 | Number | Part | as dilute | | | | | in in in | _ | |
| 220 | | | 120 | | N 0 | r. | 071223 | Number | Lot | d to (mL): | 6UTB | 1000 | Ambient (20 °C) | | 060624 Selenium (Se) | 57034 | |
| Ŋ | | | 4 | | ω | 3.702 | 0.1000 | Factor | Dilution | 2000.07 | | | <u>೦</u> | | Se) | | |
| 230 | | | 130 | | 90 | sec]:58 | 200.0 | Val. (mL | Initial | 0.100 | 5E-05 | | | | | | |
| 240 | | | 140 | | 40 | 33.702 sec]:58034.D# [Count] [Linear] | 0.084 | Vol. (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 2 | 10002.5 | Conc. (µg/mL | Initial | | | | (mL) | 40.0 | Zin Zin | Solvent: | |
| o | | | | | | | 1000.0 | Conc. (µg/mL) Conc. (µg/mL) | Final | | | | | Nitric Acid | | | (1) |
| | | | 170 | | 70 | | 2.2 | .) +/- (µg/mL) | Uncertainty | Expanded | Reviewed By: | K | N | Formulated By: | M | | 10 |
| | | | 180 | | 80 | | 7782-49-2 | C | (So | | y: | 200 | 11 | Ву: | | | |
| | | | 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 | | |
| | | | 200 | | 100 | | | NA) |). On Atta | rmation | ntas | , | / | 5 | | | |
| | | | - | | J | | orl-rat 6700 mg/kg | LDS0 | ched pg.) | | 060624 | | | 060624 | | | |
| | | | | | | | 3149 | SRM | NIST | | 4 | | | 4-1 | | _ | |

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

| | | | | | | | I race M | 1etals | Verifica | ition | oy ICP-M | S (H | g/mL) | | | | | | |
|----|-------|-----|-------|----|-------|----|----------|----------|----------|-------|----------|------|-------|----|-------|----|-------|----|-------|
| Αl | 40.02 | CG | <0.02 | Dγ | <0.02 | HH | <0.02 | <u> </u> | <0.02 | Z. | <0.02 | Pr | <0.02 | Se | ı | 16 | 40.02 | W | 40,02 |
| ЗЪ | <0.02 | ದ್ದ | <0.2 | 댴 | <0.02 | 풘 | <0.02 | Ę | <0.02 | ₽ | <0.02 | Re | 40.02 | S: | <0.02 | Te | <0.02 | U | <0.02 |
| As | <0.2 | ಕಿ | <0.02 | 핕 | <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 | <0.02 | ₽. | <0.02 | Na | <0.2 | Ħ | <0.02 | 4 | <0.02 |
| Ве | 40.01 | ť | 40.02 | G | <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 | ଫୁ | <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 | Nd | <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).





M5963 M5964 M5965 M5966 M5967 M5968

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

Revision No.: 0

Certificate of Analysis

| Test | Specification | Result |
|-----------------------------------|---------------|-------------|
| Assay (HNO3) | 69.0 - 70.0 % | 69.6 % |
| Appearance | Passes Test | Passes Test |
| Color (APHA) | ≤ 10 | 5 |
| Residue after Ignition | ≤ 2 ppm | < I ppm |
| Chloride (CI) | ≤ 0.08 ppm | < 0.03 ppm |
| Phosphate (PO ₄) | ≤ 0.10 ppm | < 0.03 ppm |
| Sulfate (SO ₄) | ≤ 0.2 ppm | < 0.2 ppm |
| Trace Impurities - Aluminum (Al) | ≤ 40.0 ppb | < 1.0 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 2.0 ppb |
| Trace Impurities – Barium (Ba) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Beryllium (Be) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Bismuth (Bi) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Boron (B) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Cadmium (Cd) | ≤ 50 ppb | < 1 ppb |
| Trace Impurities - Calcium (Ca) | ≤ 50.0 ppb | < 0.2 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 30.0 ppb | < 1.0 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Copper (Cu) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Gallium (Ga) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Germanium (Ge) | ≤ 20 ppb | < 10 ppb |
| Trace Impurities - Gold (Au) | ≤ 20 ppb | < 5 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | < 50 ppb |
| Trace Impurities - Iron (Fe) | ≤ 40.0 ppb | < 1.0 ppb |
| Trace Impurities - Lead (Pb) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities – Lithium (Li) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb | < 1 ppb |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Nickel (Ni) | ≤ 20.0 ppb | < 5.0 ppb |

>>> Continued on page 2 >>>





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

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

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

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

\$

Certified Reference Material CRM

20

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

Part # 57003 Lot # 062124

1 of 2

Printed: 6/24/2024, 11:20:08 PM

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



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):

| 40.02 40.01 | 40.2 40.02 40.01 | 40.2 40.02 | 40.2 | | <0.02 | <0.02 | | | | |
|----------------|------------------------|---------------|-------|-------|-------|-------|-------|---|-----------|---|
| გ ბ | Ω. | | ొ | Ç | Ca | Ω | | | | |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.2 | <0.02 | | | | |
| ΔII | ဝွ | Ga | ପ୍ର | Eu | 퍔 | Ьy | | | | |
| 4000 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 20.02 | | | | |
| Pb | 7 | Fe | ъ | F | Но | Н | 2117 | l | | |
| <0.02 | <0.02 | <0.2 | <0.02 | <0.02 | <0.02 | 20.02 | 2000 | | Trace M | |
| N | Мо | Hg | Mn | Mg | Lu | Ē | | l | letals | ١ |
| <0.02 | <0.02 | <0.2 | <0.02 | <0.01 | <0.02 | 1 | 7 | | Verifica: | |
| × | 7 | P | Pd | Ç | 8 | 1 2 | Z. | l | tion b | ١ |
| <0.2 | <0.02 | <0.02 | <0.02 | 20.02 | 20.02 | 0.02 | 40.00 | ľ | V ICP-M | ۱ |
| Sc | Sm | Ku | 86 | 2 3 | 1 70 | : | Pr | | br) S | ۱ |
| <0.02 | <0.02 | 20.02 | <0.02 | 0.02 | 50.02 | 5 6 | <0.02 | | | ١ |
| la | | , H | N | 3v | 2 | 2 ! | Sc | ۱ | | I |
| 20.02 | 20.02 | 20.02 | 100 | 40.02 | 0.00 | 3 | <0.2 | | | |
| E | 1 1 | ? [| 1 : | 1 : | 3 5 | 7 | Tb | ı | | I |
| 20.02 | 40.02 | 3 6.02 | 3 6 | 0.02 | 0.00 | 2 | <0.02 | | | |
| 1 | 7 1 | 7, | < ? | \$. | < 0 | = | W | | | |
| 20.02 | 40.02 | 200 | 3 8 | 3 8 | 000 | c0.02 | <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 | certif |
| | cids, | fied va |
| • | 18.2 | alue is |
| = | ă | St |
| | egohr | he cc |
| | 2 | ž |
| • | lei. | en |
| | 9 | 3 |
| | ΣĖ | |
| | ä | 9 |
| | wate | calc |
| | Ţ | 믔 |
| | ca | E |
| | ğ | 0 |
| | ate. | TOTT |
| | C | g |
| | las | Ze. |
| | S | 3 |
| | 9 | 2 |
| | las | 7 |
| | ΝS | 370 |
| | ar | 7 |
| | 9 | 2 |
| | nd | . 🗒 |
| | the | |
| | hig | : = |
| | nes | usp. |
| | p | ď |
| | Ē | . 5 |
| | ₹ | 5 |
| | ra | 2 |
| | 2 | Č, |
| | Jac | ŭ |
| | en | . 6 |
| | als | - 0 |
| | 2 | Y |
| | e | ď |
| | Se | |
| | Ö | - 3 |
| | 5 | . 5 |
| | | |
| | | |
| | | |

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).

* Standards are prepared gravimetrically using balances that are calibrated.

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

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

* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST

* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST

* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST

Part # 57003 Lot # 062124

Printed: 6/24/2024, 11:20:08 PM

2 of 2

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_{CRM/RM}, 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-DES 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 properties of the properties

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

> uA 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 | 34500.0 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 MIST 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 Columbiant of the contract of the Columbiant of the Colu

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. | Idoseomeni | |
|---|-----------|-------------------------------|-------------------------|---|
| 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-V001 (no a | | | | |
| (where X = Zr, Mo, 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-OES 336.121 nm | |
| ла, Та, Сг, U М М9 Ω- | 1 1 | | F Note: This standar | ŀ |
| W, Mo, Co | | In/gy 4500000 \ cocos- | nous prepries sur secon | ٠ |
| | | | | |

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) brookite (fuse in Pt0 with KZSZO7); Ores (fuse in Pt0 with KZZZO7); Ores (fuse in Pt0 with provide it as plastic pigment and likely in brookite (fuse in Pt0 with provide it as plastic pigment and likely in brookite TI Containing Samples (Preparation and Solution) - Metal (Soluble in H2O / 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° - 24° 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 biselfe 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 creatial increase in the analysis of the contration of the

- Store between approximately 4° - 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 it 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 AR-153 https://ab | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | dited |
|-------------|-------------------------------|-----------------------------|---|--|---------------------------------|--|-------|
| ¥ | N # 10 | 4 | 2 | 2/11/0 | > | | |
| Solvent: | Solvent: 24002546 Nitric Acid | Nitric Acid | | Contraction of the Contraction o | | | |
| 2% | 40.0 | Nitric Acid | | Formulated By: | Benson Chan | 031524 | |
| | (TE) | | | M | Hento | | |
| Uncertainty | | | | Reviewed By: | Pedro L. Rentas | 031524 | |

| Part Number: Lot Number: | | 19 | | Solvei | Solvent: 24002546 Nitric Acid | 46 Nitr | ic Acid | | A STATE OF THE STA | 1 | | |
|---|---|---------------|-----------|----------------------------------|-------------------------------|---------|--------------------------------------|----------|--|--|------------------|--------|
| Description: | Strontium (Sr) | (Sr) | | C) | 2% 40.0 | | Nitric Acid | , Itt | Formulated Bv: | Benson Chan | 8 | 031524 |
| Expiration Date: | 031527 | | | | | | | I | 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 | 99.997 | 0.10 | 41.2 | 4.85470 | 4.85502 | 1000.1 | 2.0 | 10042-76-9 | NA | orl-rat >2000mg/kg 3153a |
|---------------------------|--|-------------------|---|----------|-------|-----------------|-----------|---------|--------|-----|------------|-----|--------------------------|
| 5.0EG | [1] Spectrum No.1 | | [14.495 sec]:58138.D# [Count] [Linear] | sec]:581 | 38.D# | Coun | tj (Linea | - | | | | | |
| 2.5E6 | | | | | | | | | | | | | |
| m/z->⊶ 1.0E6 | • | 10 20 | | OG | 0 | | .00 | 09 | 02 | | 80 | .Og | 100 |
| 5.0ES | enempe emilier philosophical support which the | | | | | | | | | | | | |
| m/z-≫ 5.0E6 | | 110 120 | | 130 | 041 | 1 ⁷² | 150 | 160 | 7,0 | i i | 180 | 180 | 500 |
| 2.5E6 | | | | | | | | | | | | | |
| ν-z/π | ų | 220 | | 230 | 240 | 14 | 250 | 280 | | | | | |





Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

| | | | | | | ı. | Trace Me | etals | Verifica | tion | by ICP-I | ξ | (na/ml) | | | | | | |
|----------------|--------------------------------------|---------------|---------------|-----------|---------------------|--|-------------------|--------------------|--|------|----------------|---------------------|---------|-------------|-----------------|-------------|--|------------|--|
| Name of Street | THE RESIDENCE OF THE PERSON NAMED IN | MARKET STATES | WITH STATE OF | Section 1 | Control of the last | THE REAL PROPERTY. | The second second | THE REAL PROPERTY. | New Street, Square, Street, Square, Sq | | Anstrastolicum | STATE OF THE PERSON | в | Million Co. | STATE OF STREET | STATISTICS. | Section and Control of the Control o | | The state of the s |
| ₹ | <0.02 | ਲ | <0.02 | Dy | <0.02 | H | <0.02 | E | <0.02 | Z | <0.02 | ď. | L | Se | <0.2 | P | \$005 | B | 200 |
| Sp | <0.02 | రి | <0.2 | 占 | <0.02 | Ho | <0.02 | 5 | <0.02 | Ŷ. | <0.02 | Re | _ | Si | <0.02 | Ę | 200 | = | 5 |
| As | <0.2 | ඊ | <0.02 | En | <0.02 | 'n | <0.02 | Mg | <0.01 | ő | <0.02 | 뮢 | | Ag | <0.02 | F | 200 | > | |
| Ba | <0.02 | ඊ | <0.02 | 3 | <0.02 | 긔 | <0.02 | Mn | <0.02 | Pd | <0.02 | R _b | | ž | \$ Q | É | 200 | - \$ | |
| æ | <0.01 | ڻ | <0.02 | త్ | <0.02 | æ | 40.2 | Hg | <0.2 | Д | <0.02 | 2 | <0.02 | 5 | ! - | <u> </u> | 20:05 | ? > | |
| B. | <0.02 | රි | <0.02 | පී | <0.02 | 2 | <0.02 | Wo | <0.02 | ď, | <0.02 | S | | v. | 200 | 5 | 000 | , K | |
| В | <0.02 | ರೆ | <0.02 | Au | <0.02 | 윤 | <0.02 | ğ | <0.02 | M | <0.2 | Š | Ì |) E | 40.02 | Ē | 0.05 0.05 | 1 2 | 7 6 6 |
| | | | | | | The same of the sa | | | | | | | | | | | - | 1 | |

(T) = Target analyte

Physical Characterization:

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



Certified by:

1. P

Lot # 031524

^{*} 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

M5984 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:

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%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

10000 ± 30 µg/mL

Density:

1.032 g/mL (measured at 20 \pm 4 °C)

Assay Information:

Assay Method #1

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_{CRM/RM}, 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 uchar i

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

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

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

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = 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.

Characterization of CRM/RM by One Method

is used is the mean of individual results:

X_a = mean of Assay Method A with

u_{bb} = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

XCRM/RM = (Xa) (uchar a)

k = coverage factor = 2

uchar a = the errors from characterization

uts = transport stability standard uncertainty

Certified Value, X_{CRM/RM}, where one method of characterization

ucher a = the standard uncertainty of characterization Method A

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

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 | M | Na | | 0.086360 | M | Se | < | 0.005200 | M | Zn | | 0.030125 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| M | A! | | 0.014862 | 0 | Fe | | 0.002410 | М | Nb | < | 0.000570 | 0 | Si | | 0.024100 | 0 | Zr | < | 0.002600 |
| M | As | < | 0.003500 | M | Ga | < | 0.000570 | М | Nd | | 0.000923 | M | Sm | | 0.000461 | | | | |
| M | Au | < | 0.001700 | M | Gd | < | 0.003500 | М | Ni | < | 0.005700 | M | Sn | < | 0.002300 | | | | |
| 0 | В | | 0.002209 | М | Ge | < | 0.005200 | М | 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 | M | Hg | < | 0.000570 | М | Pb | | 0.005020 | M | Tb | | 0.001044 | | | | |
| М | Bi | < | 0.003500 | M | Но | | 0.009037 | M | Pd | < | 0.005100 | М | Te | < | 0.002300 | | | | |
| 0 | Ca | | 0.009841 | M | In | < | 0.002300 | M | Pr | < | 0.002300 | М | Th | < | 0.000570 | | | | |
| M | Cd | < | 0.000570 | М | Ir | < | 0.000570 | М | Pt | < | 0.000570 | М | Ti | < | 0.003500 | | | | |
| М | Ce | < | 0.002300 | 0 | K | | 0.018677 | М | Rb | < | 0.000570 | М | TI | < | 0.000570 | | | | |
| М | Co | < | 0.000570 | М | La | | 0.000461 | М | Re | < | 0.000570 | М | Tm | < | 0.003500 | | | | |
| М | Cr | < | 0.004000 | 0 | Li | < | 0.009300 | M | Rh | < | 0.008000 | М | U | < | 0.000570 | | | | |
| M | Cs | < | 0.000570 | М | Lu | | 0.000582 | M | Ru | < | 0.000570 | М | ٧ | | 0.001265 | | | | |
| М | Cu | | 0.002610 | 0 | Mg | | 0.001486 | n | S | < | | М | W | < | 0.002300 | | | | |
| М | Dy | | 0.003815 | М | Mn | | 0.000582 | М | Sb | | 0.005422 | s | Υ | < | | | | | |
| М | Er | | 0.003615 | М | Мо | < | 0.005700 | М | Sc | < | 0.001200 | М | Yb | | 0.001827 | | | | |

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

6.0 **INTENDED USE**

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

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures Terms and Conditions of Sale.

https://www.inorganicventures.com/terms-and-conditions-sale. 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 $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

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

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

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in

H2O/ HNO3); Ores (Carbonate fusion in Pt0 followed by 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/axial view):

| Technique/Line | Estimated D.L. | Order | Interferences (underlined indicates severe) |
|--------------------|------------------------|-------|---|
| ICP-MS 89 amu | 0.8 ppt | N/A | 73Ge16O, 178Hf+2 |
| ICP-OES 360.073 nm | 0.005 / 0.000036 µg/mL | 1 | Ce, Th |
| ICP-OES 371.030 nm | 0.004 / 0.00007 µg/mL | 1 | Ce |
| 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: 540.565.3012; 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** Mayor May

Certificate Approved By:

Muzzammii Khan Stock Laboratory Supervisor

Certifying Officer:

Paul Gaines 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 O | 5.0E6 | m/z-> | 1.1.1. | 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 Number Co | | 6UTB | 10000 | Ambient (20 °C) | 011636 | Aluminum (Al) | 011623 |) |
| 230 | | | 130 | | | 30 | | | | 5.014 sec]: | 10000 99.999 | Nominal Purity 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: | > |
| 250 | | | 150 | | | 50 | | | | Count] [Line | 0 273.9779 | ay Target) Weight (g) | | y | | (1117) | | | it: 20510011 | |
| 260 | | | 160 | | | 60 | | | | »ar] | 274.0078 1 | Actual Weight (g) Con | | | | | Nitric Acid | | Nitric Acid | |
| | | | 170 | | | 70 | | | | | 10001.1 2 | Actual Unce Conc. (µg/mL) +/- (| | Revi | | | Form | 7 | ~e | 7 |
| | | | 180 | | | 80 | | | | | 20.0 7784-27-2 | Expanded (Si Uncertainty (Si +/- (µg/mL) CAS# | | Reviewed By: | tach | | Formulated By: | 200 A contract | 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 LD50 SRM | | 011623 | | | 011623 | | | |

Nitric Acid 69%

Rew. 1 — 08/0/12025 Pare 1 — 16034, M6034 m6035, M6038, m6036, Certificate of Analysis





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

Manufactured Date: 2024-03-26

Retest Date: 2029-03-25 Revision No.: 0

| 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 (PO4) | ≤ 0.10 ppm | < 0.03 ppm |
| Sulfate (SO ₄) | ≤ 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 (Мп) | ≤ 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.: 24D1062002

| Test | Specification | Result |
|-------------------------------------|---------------|------------|
| Trace Impurities – Niobium (Nb) | ≤ 50.0 ppb | < 1.0 ppb |
| Trace Impurities - Potassium (K) | ≤ 50 ppb | 16 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 | 10 par/ml |
| Particle Count - 1.0 µm and greater | ≤ 10 par/ml | 3 par/ml |

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

Jamie Croak
Director Quality Operations, Bioscience Production

Nitric Acid 69%

Rew. 1 — 08/0/12025 Pare 1 — 16034, M6034 m6035, M6038, m6036, Certificate of Analysis





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

Manufactured Date: 2024-03-26 Retest Date: 2029-03-25

Revision No.: 0

| 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 (PO4) | ≤ 0.10 ppm | < 0.03 ppm |
| Sulfate (SO ₄) | ≤ 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 (Мп) | ≤ 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.: 24D1062002

| Test | Specification | Result |
|-------------------------------------|---------------|------------|
| Trace Impurities – Niobium (Nb) | ≤ 50.0 ppb | < 1.0 ppb |
| Trace Impurities - Potassium (K) | ≤ 50 ppb | 16 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 | 10 par/ml |
| Particle Count - 1.0 µm and greater | ≤ 10 par/ml | 3 par/ml |

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

Jamie Croak
Director Quality Operations, Bioscience Production

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





paper m6039 Certificate of Analysis m6040

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

Revision No.: 0

| 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 | 1.192 |
| ACS – Bromide (Br) | ≤ 0.005 % | < 0.005 % |
| ACS - Extractable Organic Substances | ≤ 5 ppm | < 1 ppm |
| ACS Free Chlorine (as Cl2) | ≤ 0.5 ppm | < 0.5 ppm |
| Phosphate (PO ₄) | ≤ 0.05 ppm | 0.03 ppm |
| Sulfate (SO ₄) | ≤ 0.5 ppm | < 0.3 ppm |
| Sulfite (SO ₃) | ≤ 0.8 ppm | 0.3 ppm |
| Ammonium (NH ₄) | ≤ 3 ppm | < 1 ppm |
| Trace Impurities - Arsenic (As) | ≤ 0.010 ppm | < 0.003 ppm |
| Trace Impurities – Aluminum (AI) | ≤ 10.0 ppb | < 5.0 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 3.0 ppb |
| Trace Impurities – Barium (Ba) | ≤ 1.0 ppb | < 1.0 ppb |
| Trace Impurities – Beryllium (Be) | ≤ 1.0 ppb | < 1.0 ppb |
| Trace Impurities - Bismuth (Bi) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities - Boron (B) | ≤ 20.0 ppb | 2.2 ppb |
| Trace Impurities - Cadmium (Cd) | ≤ 1.0 ppb | < 1.0 ppb |
| Trace Impurities - Calcium (Ca) | ≤ 50.0 ppb | 31.0 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 1.0 ppb | 0.5 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 1.0 ppb | 0.2 ppb |
| Trace Impurities - Copper (Cu) | ≤ 1.0 ppb | < 0.1 ppb |
| Trace Impurities - Gallium (Ga) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities - Germanium (Ge) | ≤ 3.0 ppb | < 2.0 ppb |
| Trace Impurities - Gold (Au) | ≤ 4.0 ppb | < 0.2 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | < 50 ppb |
| Trace Impurities - Iron (Fe) | ≤ 15 ppb | 3 ppb |

>>> Continued on page 2 >>>





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

| Test | Specification | Result |
|--|------------------|------------|
| Trace Impurities - Lead (Pb) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities - Lithium (Li) | ≤ 1.0 ppb | < 0.1 ppb |
| Trace Impurities - Magnesium (Mg) | ≤ 10.0 ppb | 2.2 ppb |
| Trace Impurities - Manganese (Mn) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities - Mercury (Hg) | ≤ 0.5 ppb | < 0.1 ppb |
| Trace Impurities - Molybdenum (Mo) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities – Nickel (Ni) | ≤ 4.0 ppb | 0.2 ppb |
| Trace Impurities – Niobium (Nb) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Potassium (K) | ≤ 9.0 ppb | < 1.0 ppb |
| Trace Impurities – Selenium (Se), For Information Only | | < 1.0 ppb |
| Trace Impurities – Silicon (Si) | ≤ 100.0 ppb | < 10.0 ppb |
| Trace Impurities – Silver (Ag) | ≤ 1.0 ppb | < 0.3 ppb |
| Trace Impurities – Sodium (Na) | ≤ 100.0 ppb | 2.0 ppb |
| Trace Impurities - Strontium (Sr) | ≤ 1.0 ppb | < 0.2 ppb |
| Frace Impurities – Tantalum (Ta) | ≤ 1.0 ppb | < 0.9 ppb |
| Frace Impurities – Thallium (TI) | ≤ 5.0 ppb | < 2.0 ppb |
| Frace Impurities – Tin (Sn) | ≤ 5.0 ppb | < 0.4 ppb |
| Frace Impurities – Titanium (Ti) | ≤ 1.0 ppb | 0.2 ppb |
| race Impurities – Vanadium (V) | ≤ 1.0 ppb | < 0.2 ppb |
| race Impurities – Zinc (Zn) | ≤ 5.0 ppb | < 0.2 ppb |
| race 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.: 24D1562005

Test Specification Result

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

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC



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: 13827 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 BE BE | |
|--------------------|--|----------|
| | 40.2 40.2 40.2 40.0 40.0 40.0 40.0 40.0 | |
| | 585855 | |
| | 40.02 40.02 40.02 40.02 40.02 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 | 442 442 442 442 442 442 442 442 442 442 | Verifica |
|) = Target analyte | K A A B & A K | ation |
| ılytе | 4000 4000 4000 4000 4000 4000 | by ICP- |
| | S R R R R | NO C |
| | 444 | (m/) |
| | T _a S ₇ S ₈ | |
| | 402 402 402 402 402 | |
| | in Signation in the state of th | ı |
| | 40.02 40.02 40.02 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.

* 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).

www.absolutestandards.com



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-> 2.0E7 | 2. 6 8 | 5.0E5 | 2.0 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 O | | | | | | |
| 0 | | 180 | | 9 | | |
| | | 170 | | 70 | | |
| | | 180 | | 8 | | |
| | | 190 | | 8 | | |
| | | | | Constitution or services for the control of the con | | |
| | | 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 | - | 1 | 8 | | | | |
| | | 2 | 2 8 | 3 | ζ. | 9 | ر 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 | Ęį. | 1 | Ž | Target State | | | |
| | | ∆ 022 | 70.02 | 3 | ∆ 002 | 2000 | 3 | 20.02 | | _ ∆0,02 | 2000 | 2002 | | | | |
| | | 3 | 2 | 1 | ď, | = | 7 | 5 | 1 | H | 111 | HF. | | | | |
| | | ₽ | 20.02 | 3 | <u> </u> | 20.02 | 8 | A.03 | - | 200 | 2000 | 400 | | FI GCG IA | 1300 | |
| | | 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 | Pa | ! | ဂ္ဂ | M | Z | 2 | | | COL |) | |
| akao | 20.6 | 3 | 40,02 | 40.00 | 3 | A0.02 | | 2002 | 20.00 | 3 | 20.02 | | | DY ICE-N | | |
| | Ę | ç | Si | M | B | 25 | | 쭈 | 700 | 9 | 7 | | | S | 10 | |
| | 20.02 | 3 | 20.02 | 20.02 | 3 | ∆ 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 | 40.0 2 | 70.0> | 3 | <u>A</u> | 20.02 | 3 | 20.02 | | 02 | Section Control Control | | | | |
| | E | 3 1 | S | I | 1 | = | 11 | 3 | ie. | į | J | | | | | |
| | 20.02 | 0.00 | A 62 | 40.02 | | A 63 | 20.02 | 3 | ∆0.02 | - | 900 | | | | | |
| | 177 | 1 | 7 _n | 7 | : ; | ş | _ | 4 | 9 | | W | Company | | | | |
| | 40.02 | 10.01 | 3 | 80.02 | 20.04 | 3 | 20.02 | 3 | 80.03 | 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.

* 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).

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

www.absolutestandards.com

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

www.absolutestandards.com



| | | | | | | | race Me | letals | Verificat | tion | by ICP-I | S | ug/mL) | | | | | | |
|----|--|-----|-------|----|-------|-----|------------------|--------|-----------|------|----------|---------|---------------|-----|-------|---|---------------|----|--------|
| | The state of the s | | | | | | The Park of | , J | | | | | | | | | | | |
| A | <0.02 | Ω | <0.02 | Dy | <0.02 | 出 | <0.02 | Ľ | <0.02 | Z | <0.02 | 7 | <0.02 | Se | <0.2 | 4 | 40.02 | W | <0.02 |
| 4S | 40.02 | ဂ္ဂ | 40.2 | 덬 | 40.02 | Ж | 40.02 | Li | <0.02 | 3 | 40.02 | ₽ Re | 40.02 | S: | 40.02 | ď | A).02 | a | \$0.02 |
| As | 40.2 | Ç | <0.02 | 땹 | <0.02 | In | <0.02 | Mg | <0.01 | တ္တ | 40.02 | 짜 | <0.02 | Agr | 7 | ∄ | <0.02 | < | 40.02 |
| Ва | <0.02 | రి | 40,02 | 8 | <0.02 | 듁 | 40.02 | Mn | <0.02 | Pd | <0.02 | R. | 40.02 | N | 40.2 | ∄ | <u>\$</u> | 상 | <0.02 |
| Ве | 40.01 | Ω | <0.02 | හු | <0.02 | ਲੋਂ | 40.2 | Hg | 40.2 | Þ | 40.02 | R | A0.02 | Ž, | 40,02 | ď | ♦ 0.02 | < | 40.02 |
| 쯨 | <0.02 | င္ပ | 40.02 | ନ | <0.02 | 5 | < 0.02 | Mo | <0.02 | 77 | 40.02 | Sin | △ 0.02 | c/a | 40.02 | S | A) (2) | 7, | 40.07 |
| В | <0.02 | δ | <0.02 | Au | <0.02 | 광 | <0.02 | Z | <0.02 | * | 40.2 | Sc | <0.02 | ī | <0.02 | Ħ | <0.02 | 2 | <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).

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



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 | | | င္ပိ | | | | | | |
| 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 SE | > | |
| (Solvent Safety Info. On Attached pg.) | SDS Information | | Pedro L. Rentas | " freshies | A A | | Aleah O'Brady | 0 | San O Basin | 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 | 2.0E6 | |
|---------|-------|-------|----------|------|----------|-------|---|--|
| N | | | -1 | | | | El opegrum No. | |
| 210 | | | 10 | | ö | | 3 | |
| 220 | | | 120 | | N O | | | |
| | | | | | | | 4 0 | |
| 230 | | | 130 | | 9 | | []4.044 sec]:57081.D# [Count] [Linear] | |
| 240 | | | <u> </u> | | 4 | | 57081. | |
| ō | | | 140 | | 40 | | <u> </u> | |
| 250 | | | 1 | | OI. | | | |
| | | | | | | | 000000000000000000000000000000000000000 | |
| 0 | | | 160 | | 60 | | | |
| | | | 4 | | 70 | | | |
| | | | 170 | | 0 | | | |
| | | | 180 | | 80 | | | 1000 |
| | | | | | | | | |
| | | | 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):

| | | œ | Id | : ! | H. | 52 | į | As | 30 | 2 | 2 | | | | |
|----------------------|-------|--------------|----------------|-------|-------|---|--------|-------------|---------------|--------------|------------------------------|--------------|---------|-----------------|---|
| | | 40.02 | 20.02 | 5 8 | 200 | 20.02 | e i | <u>۵</u> | 20.02 | 3 | 40.02 | | | | |
| | ŀ | 5 | S | , (| , | C | , { | 3 | Ç | > | 5 | | | | |
| | | 4000 | 40.02 | 20.02 | 3 | <0.02 | 0.02 | 3 | 2.0 | > | <0.02 | | | | |
| | | A | ද | Ç, | ? | Gd | į | ŗ | 돡 | , | Þ | | l | | |
| | 20,02 | 3 | ♦ 0.02 | 20.02 | 3 | 0.02 | 20.02 | 3 | 40.02 | | A0.02 | | | | |
| | | ğ | L _a | 7 | 1 | = | Е | - - - | Но | ! | H. | | l. | | |
| | 70.02 | 3 | ∆ .02 | 7.05 | 5 | ∆ 0.02 | 20.02 | 3 | A).02 | | 40.02 | | | race M | |
| | | ź. | Mo | 9H | | š | 1V192 | | Į, | ı | 1.4 | Service III | | S | |
| (T) = Target analyte | 20.02 | 3 | A 0.02 | 40.2 | , | ∆ 0.02 | 10.02 | 2 | &.02 20.02 | 40.04 | 2003 | 450 E 3 00 W | 200 | Serifics | |
| et anal | F | 4 ; | P | 70 | · ¦ | 2 | ç | , | Z | 142 | Z. | | | ₹. 2 | |
| yte | 2.05 | 0.01 | 3 | <0.02 | 1000 | <0.02 | <0.02 | , | ∆ 0.02 | 20.00 | 3 | | 200 | 200 | |
| | Sc | E | 3 | R | i | ア | 공 | | Re | 2 | P | | | ころと | |
| | A0.02 | 20.02 | 3 | <0.02 | 40.04 | <n 02<="" td=""><td>40.02</td><td>10101</td><td>2000</td><td>20.02</td><td>3000</td><td></td><td>/HI /Br</td><td></td><td></td></n> | 40.02 | 10101 | 2000 | 20.02 | 3000 | | /HI /Br | | |
| | Ta | ç | n | Ş | TAG | Z | Ag | Ş | 2 | č | | | | | |
| | 40,02 | 20.02 | 3 | ∆.02 | 7.07 | 3 | A).02 | 40.04 | 3 | 46 | | | | | |
| | 11 | DC | ? | ď | 120 | 7 | Ħ | č | ş-1 | 10 | | | | | ı |
| | 40.02 | 20.02 | 3 | 40.02 | 70.02 | 4 | H | 70.02 | 3 | ∆ .02 | | | | | |
| | Zr | 120 | 1 | × | ID | ş | < | 0 | 1 | \$ | | | | | |
| | 40.02 | 40.02 | | A).02 | 20,02 | 8 | A) (2) | 70.02 | 3 | <u>&</u> | THE RESIDENCE AND THE PERSON | | | | |

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

| V-4 K | 2.588 | m/z->- 5.0E8 | 1.0E7 | m/z-> | 1.006 | 2.006 |
|----------|-------|-----------------|-------|-------|-------|-------|
| | | | | | | |
| 210 | | 110 | | ō | | |
| 220 | | 1 0 | | N. | | |
| 0 | | 0 | | | | |
| NGO O | | 130 | | 30 | | |
| 240 | | 140 | | 4.0 | | |
| 0 | | | | | | |
| 000 | | 150 | | 50 | | |
| 260 | | 160 | | 60 | | ı |
| 0 | | 0 | | | | |
| | | 170 | | 70 | | |
| | | 180 | | 80 | | |
| | | C | | | | |
| | | 190 | | 90 | | |
| | | 200 | | 100 | | |
| | | C | | O | | |

Part # 57023

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

| | E | <u> B</u> | Ве | Ва | As | . 20 | 2 2 | 2 | I | |
|----------------------|--|-----------|-------|-------------------|--------------|---------------|---------------|-------------------------|----------------|--|
| | 40,02 | 80,00 | 40.01 | A).03 | 40.2 | 20.02 | 8 6 5 | A PA | | |
| | 5 | ပ | 유 | సి | ೪ | <u></u> | ۶ د | 2 | | |
| | 40.02 | 40.02 | <0.02 | 40.02 | 40.02 | 40.2 | 20.02 | 3 | | |
| | Au | ဝူ | స్ట | 8 | 멸 | 耳 | کِ ر | | | |
| | 40.02 | 40.02 | 40,02 | <0.02 | 60.02 | <0.02 | 20.02 | | | |
| | 3 | Ľ | 737 | 5 | rī. | Но | H | | | |
| | 40.02 | 40.02 | 40,2 | 0.02 | 40.02 | ∆ .02 | 40.02 | | Trace M | |
| | 폽 | Mo | He | Mn | Mg | 댭 | Σ | | etals | |
| (T) = Target analyte | 40.02 | 40.02 | 402 | 40,02 | 10.0 | 40.02 | 40.02 | | Verifica | |
| et analy | ~ | Þ | ס | 2 | ဝ္ဂ | 7 | 3 | | tion I | |
| 6 | A0,2 | A).02 | A).02 | & 0.02 | 40.02 | 40,02 | 40.02 | INTERNATIONAL PROPERTY. | oy ICP-N | |
| | Sc | SB | 7 | 공 - | ₽ | Re | 7 | | ST ST ST | |
| | 40.02 | A (| A | 40.02 | A 0.02 | <0.02 | <0.02 | | <u></u> | |
| | ng (| so s | ? | Z, | Ag | ī. | Se. | | | |
| | 40.02 | A) 65 | 3 6 | 40.2 | A) ()2 | 8.02 | <0.2 | | | |
| | H S | 3 | 7 : | 3 | i | e e | 4T | | | |
| | 40.02 | A 60 | 5 6 6 | 2 50 | A 02 | A 0.02 | <0.02 | STATE OF STATE OF | | |
| | 27 | 7, | < 5 | , | < 1 | q | ¥ | SALES IN SALES | | |
| | 6.65 6.65 6.65 6.65 6.65 6.65 6.65 6.65 | 3 5 | 3 6 | 3 · | -) { | A 22 | ∆ 0.02 | Service Company | | |

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).