

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

8900, Fax: 908 789 8922

Prep Standard - Chemical Standard Summary

| Order | ID | : | P2810 |
|-------|----|---|-------|
| | | | |

Test: Metals CLP MS FULL

Prepbatch ID: PB163705,

Sequence ID/Qc Batch ID: LB132787,

| Sta | nd | ar | d I | n | |
|-----|----|----|-----|---|--|
| | | | | | |

MP81119, MP82127, MP82170, MP82568, MP82569, MP82570, MP82571, MP82572, MP82573, MP82574, MP82575, MP82576, MP82577, MP82578, MP82579, MP82580, MP82581, MP82586, MP82586, MP82587, MP82587, MP82580, MP82500, M

Chemical ID:

M4888, M5192, M5227, M5288, M5289, M5295, M5304, M5390, M5473, M5476, M5498, M5513, M5515, M5519, M5565, M5634, M5657, M5658, M5697, M5698, M5739, M5768, M5769, M5798, M5799, M5800, M5801, M5802, M5806, M5815, M5816, M5817, M5818, M5819, M5820, M5873, M5874, M5935, M5961, M5962, M5965, M5976, M5978, M5981, M5982, M5983, M6021, M6023, M6025, M6028, M6030, M6033, M6037, M6039, M6040, M6055, W2606, W3112, M5982, M5983, M5981, M5982, M5983, M5981, M5982, M5983, M5982, M5982,



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Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal | | | |
|--------------|---------|---------|------------|--------------------|----------------|----------------|------------------|-------------------------------|--|--|--|
| 169 | 1:1HNO3 | MP81119 | 06/21/2024 | 10/24/2024 | Al-Terek Isaac | METALS_SCA | METALS_PIP | | | | |
| | | | | | | LE_2 (M SC-2) | ETTE_1 (ICP | 06/21/2024 | | | |
| 50014 | A) | | | | | | | | | | |

FROM 1250.00000ml of M5935 + 1250.00000ml of W2606 = Final Quantity: 2500.000 ml

| Recipe | NAME | No | D D.4. | Expiration | <u>Prepared</u> | 0 1 - 10 | 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



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Metals STANDARD PREPARATION LOG

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|-----------|-----------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3964 | CONC.LCSS SPIKE | MP82170 | 09/04/2024 | 09/27/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/04/2024 |

FROM

 $0.25000 \text{ml of M5473} + 0.25000 \text{ml of M5698} + 0.25000 \text{ml of M5798} + 0.25000 \text{ml of M5800} + 0.25000 \text{ml of M5801} + 0.25000 \text{ml of M5981} + 0.25000 \text{ml of M5983} + 0.25000 \text{ml of M6023} + 0.25000 \text{ml of M6025} + 0.25000 \text{ml of M6028} + 0.25000 \text{ml of M6030} + 0.50000 \text{ml of M5809} + 0.50000 \text{ml of M5698} + 0.50000 \text{ml of M5697} + 0.50000 \text{ml of M5802} + 1.25000 \text{ml of M5809} + 1.25000 \text{ml of M5819} + 1.25000 \text{ml of M5819} + 1.25000 \text{ml of M5819} + 1.25000 \text{ml of M5810} + 1.25000 \text{ml} \text{of M5810} + 1.25000 \text{ml$

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Mohan Bera |
|--------------|----------------------------------|------------|------------|--------------------|-----------------|----------------|------------------|---------------------------|
| 1122 | ICPMS CALIB BLANK(S0/ICB/CCB) | MP82568 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | None | 09/30/2024 |

FROM 25.00000ml of M6040 + 4925.00000ml of W3112 + 50.00000ml of M6037 = Final Quantity: 5000.000 ml



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Metals STANDARD PREPARATION LOG

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|-------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 2902 | S8 ICPMS | MP82569 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM

1.00000ml of M6033 + 2.50000ml of M5288 + 2.50000ml of M5515 + 5.00000ml of M5498 + 5.00000ml of M5806 + 79.0000ml of MP82568 = Final Quantity: 100.000 ml

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|-----------|---------------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3947 | S7(SFAM,6020,200.8) | MP82570 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM

 $1.00000 \text{ml of M5818} + 1.00000 \text{ml of M5981} + 1.00000 \text{ml of M5983} + 1.90000 \text{ml of M6033} + 10.00000 \text{ml of M5976} + \\ 10.00000 \text{ml of M5978} + 10.00000 \text{ml of M6037} + 2.00000 \text{ml of M5815} + 2.00000 \text{ml of M5817} + 2.50000 \text{ml of M5476} + \\ 4.00000 \text{ml of M5390} + 4.00000 \text{ml of M6025} + 4.90000 \text{ml of M5515} + 4.90000 \text{ml of M5519} + 5.00000 \text{ml of M6040} + 50.00000 \text{ml} \\ \text{of M5304} + 829.10000 \text{ml of W3112} + 9.00000 \text{ml of M5697} + 9.00000 \text{ml of M5698} + 9.00000 \text{ml of M5768} + 9.90000 \text{ml of M5768} + 9.90000 \text{ml of M5768} + 9.90000 \text{ml} \\ \text{of M5768} + 9.90000 \text{ml of M5768} + 9.90000 \text{ml} \\ \text{of M5768} + 9.90000 \text{ml of M5768} + 9.90000 \text{ml} \\ \text{of M5768} + 9.90000 \text{ml} \\ \text{o$



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Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|---------------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3948 | S6(SFAM,6020,200.8) | MP82571 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|-----------|---------------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3949 | S5(SFAM,6020,200.8) | MP82572 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 73.50000ml of W3112 + 25.00000ml of MP82570 = Final Quantity: 100.000 ml



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Metals STANDARD PREPARATION LOG

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|---------------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3954 | S4(SFAM,6020,200.8) | MP82573 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|----------------------|---------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | NAME | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3951 | S3(SFAM, 6020,200.8) | MP82574 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 88.50000ml of W3112 + 10.00000ml of MP82571 = Final Quantity: 100.000 ml



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Metals STANDARD PREPARATION LOG

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|-----------|-------------------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3955 | S2CONC(SFAM,6020,200.8) | MP82575 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM

0.05000 ml of M5698 + 0.05000 ml of M5798 + 0.05000 ml of M5800 + 0.05000 ml of M5801 + 0.05000 ml of M5961 + 0.05000 ml of M5981 + 0.05000 ml of M5982 + 0.05000 ml of M5983 + 0.05000 ml of M6023 + 0.05000 ml of M6025 + 0.05000 ml of M6030 + 0.10000 ml of M6030 + 0.10000 ml of M5658 + 0.10000 ml of M5697 + 0.10000 ml of M5802 + 0.10000 ml of M6033 + 0.25000 ml of M5515 + 0.25000 ml of M5799 + 0.25000 ml of M5819 + 0.25000 ml of M5962 + 0.25000 ml of M5976 + 0.25000 ml of M5976 + 0.25000 ml of M5810 + 1.25000 ml of M5815 + 1.25000 ml of M5817 + 2.50000 ml of M5498 + 2.50000 ml of M5519 + 2.50000 ml of M5769 + 2.50000 ml of M5806 + 2.50000 ml of M6040 + 226.25000 ml of W3112 + 5.00000 ml of M6037 = Final Quantity: 250.000 ml

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|---------------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3956 | S2(SFAM,6020,200.8) | MP82576 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | | METALS_PIP | |
| | | | | | | | ETTE_2 (ICP | 09/30/2024 |

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 98.00000ml of W3112 + 0.50000ml of MP82575 = Final Quantity: 100.000 ml



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| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|---------------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3957 | S1(SFAM,6020,200.8) | MP82577 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 88.50000ml of W3112 + 10.00000ml of MP82576 = Final Quantity: 100.000 ml

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|-----------|-------------|------------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3958 | ICV(SFAM) | MP82578 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM 2.00000ml of M5295 + 98.00000ml of MP82568 = Final Quantity: 100.000 ml



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Metals STANDARD PREPARATION LOG

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|-------------|---------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3961 | ccv | MP82579 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM

0.20000 ml of M5513 + 0.50000 ml of M5799 + 0.50000 ml of M5818 + 0.50000 ml of M5981 + 0.50000 ml of M5983 + 1.00000 ml of M5815 + 1.00000 ml of M5817 + 1.25000 ml of M5473 + 10.00000 ml of M6037 + 12.45000 ml of M5515 + 12.45000 ml of M5519 + 2.00000 ml of M5390 + 24.95000 ml of M5498 + 24.95000 ml of M5769 + 24.95000 ml of M5806 + 25.00000 ml of M5897 + 4.50000 ml of M5697 + 4.50000 ml of M5698 + 4.50000 ml of M5978 + 5.00000 ml of M6040 + 824.35000 ml of W3112 = Final Quantity: 1000.000 ml

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|-------------|---------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 1142 | ICSA ICPMS | MP82580 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM 10.00000ml of M5873 + 90.00000ml of MP82568 = Final Quantity: 100.000 ml



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Metals STANDARD PREPARATION LOG

| <u>Recipe</u> | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|----------------------|-------------|------------|------------|-------------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> <u>I</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 1143 I | ICSAB ICPMS | MP82581 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

| FROM | 10.00000ml of M5873 | + 10.00000ml of M5874 - | + 80.00000ml of MP82568 | = Final Quantity: 100.000 ml |
|------|---------------------|-------------------------|-------------------------|------------------------------|
|------|---------------------|-------------------------|-------------------------|------------------------------|

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-------------------|-------------------------|----------------|-------------------------|------------|-------------------------------------|------------------------|-----------------------|---------------|
| <u>ID</u> 3962 | NAME MG 10PPM FOR TUNE | NO. MP82585 | Prep Date 09/28/2024 | | <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | PipetteID METALS PIP | Mohan Bera |
| 0002 | MO TOTT WIT OIL TONE | WII 02000 | 00,20,2024 | 10,22,2024 | Darasjit daswar | 140110 | ETTE_3 (A) | |

FROM 0.01000ml of M5768 + 9.99000ml of MP82568 = Final Quantity: 100.000 ml



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Metals STANDARD PREPARATION LOG

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|-----------|-------------|---------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | NAME | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3894 | TUNE 200PPB | MP82586 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM 2.00000ml of M6055 + 2.00000ml of MP82585 + 96.00000ml of MP82568 = Final Quantity: 100.000 ml

| Recipe | | | | Expiration | <u>Prepared</u> | | | Supervised By |
|-----------|-------------|---------|------------|-------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> | <u>NAME</u> | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera |
| 3903 | ISS 3PPM | MP82587 | 09/28/2024 | 10/22/2024 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 09/30/2024 |

FROM 5.00000ml of M6037 + 75.00000ml of M5739 + 170.00000ml of MP82568 = Final Quantity: 250.000 ml



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-------------------------------------|---|-----------------|-----------------------------|--|--|-----------------------|
| Absolute Standards, Inc. | 57022 / Ti, 1000 PPM, 125 ml | 070721 | 09/27/2024 | 08/06/2021 / jaswal | 08/05/2021 / jaswal | M4888 |
| 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 # |
| Absolute Standards, Inc. | 57023 / V, 1000 PPM, 125 ml | 100121 | 10/01/2024 | 07/01/2022 / bin | 10/18/2021 / bin | M5227 |
| Supplier | ItemCode / ItemName | Lot # | Expiration | Date Opened / | Received Date / | Chemtech |
| | | | Date | Opened By | Received By | Lot # |
| Absolute Standards, Inc. | 58119 / K, 10000 PPM, 500 ml | 071122 | 07/11/2025 | 09/01/2022 / jaswal | 07/21/2022 / jaswal | Lot # M5288 |
| | | 071122 Lot # | | 09/01/2022 / | 07/21/2022 / | |
| Standards, Inc. | 500 ml | | 07/11/2025 Expiration | 09/01/2022 / jaswal Date Opened / | 07/21/2022 / jaswal | M5288 |
| Standards, Inc. Supplier Absolute | ItemCode / ItemName 58113 / Aluminum (Al) | Lot # | 07/11/2025 Expiration Date | 09/01/2022 / jaswal Date Opened / Opened By 09/02/2022 / | 07/21/2022 / jaswal Received Date / Received By 07/12/2022 / | M5288 Chemtech Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|------------------------------------|--|-----------------|--------------------|----------------------------|---------------------------------|-------------------|
| Inorganic Ventures | 6020CAL-1 / Calibration Standard Method 6020 | S2-MEB711244 | 10/20/2026 | 08/07/2024 / jaswal | 04/01/2022 / jaswal | M5304 |
| 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 # |
| Absolute Standards, Inc. | 57138 / Sr, 10000 PPM, 125 ml | 082922 | 08/29/2025 | 03/16/2023 / jaswal | 03/16/2023 / jaswal | M5473 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57138 / Sr, 10000 PPM, 125 ml | 082922 | 08/09/2025 | 07/29/2024 /jaswal | 03/16/2023 / jaswal | M5476 |
| | | | | | | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Supplier Absolute Standards, Inc. | ItemCode / ItemName 58120 / Ca, 10000 PPM, 500 ml | Lot # 031523 | · - | • | | |
| Absolute | 58120 / Ca, 10000 PPM, | | Date | Opened By 08/15/2023 / | Received By 03/17/2023 / | Lot # |



| 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. | 57119 / Potassium (K) 10,000PPM | 120822 | 12/08/2025 | 01/08/2024 / bin | 03/17/2023 / bin | M5519 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CLPP-SPK-1 / SOIL/WATER SPIKE SOLN 1, 125mL | T2-MEB721963 | 07/27/2027 | 05/30/2023 / jaswal | 05/26/2023 / jaswal | M5565 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| PCI Scientific Supply, Inc. | 1403 / Hydrogen Peroxide, 30% 1 gal | 820803 | 02/03/2025 | 04/18/2024 /jaswal | 08/03/2022 / Al-Terek | M5634 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic | CLPP-SPK-4 / SOIL/WATER SPIKE SOLN | T2-MEB721144 | 07/07/2027 | 08/23/2023 / jaswal | 08/29/2023 / jaswal | M5657 |
| Ventures | 4, 125mL | | | | | |
| Ventures Supplier | 4, 125mL ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |



| 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 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | 6020ISS / 6020ISS, 10 ug/ml, Bi, Ho, In, 6Li, Rh, Sc, TB, Y | T2-MEB709511 | 09/03/2026 | 08/07/2024 / jaswal | 04/11/2022 / jaswal | M5739 |
| 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 | 01/08/2024 / bin | 01/03/2024 / bin | M5768 |
| 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 |
| | | Lot # | Expiration | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Supplier | ItemCode / ItemName | | Date | Opened by | Received by | LOL # |



| 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 / Received By | 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 / Received By | 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 / | 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 # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---------------------------------------|-----------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57016 / S, 1000 PPM, 125 ml | 122923 | 12/29/2026 | 05/20/2024 / Jaswal | 02/09/2024 / jaswal | M5816 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57116 / S, 10000 PPM, 125 ml | 071123 | 07/11/2026 | 03/01/2024 / jaswal | 02/09/2024 / jaswal | M5817 |
| 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 / | Chemtech Lot # |
| EPA | PART A / ICSA (ICPMS) STOCK SOLN | CP-MS ICSA-0803 | | 04/17/2024 / jaswal | 07/14/2022 / jaswal | M5873 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|--|---------------------|--------------------|-------------------------------|--------------------------------|-------------------|
| EPA | PART B / ICSB (ICPMS) STOCK SOLUTION | CP-MS ICSB-0803 | 04/30/2025 | 04/17/2024 / jaswal | 07/14/2022 / jaswal | M5874 |
| 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 | 12/08/2024 | 06/21/2024 / Al-Terek | 06/07/2024 / Al-Terek | M5935 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57028 / Ni, 1000 PPM, 125 ml | 041124 | 04/11/2027 | 07/02/2024 / Jaswal | 06/11/2024 / Jaswal | M5961 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Absolute Standards, Inc. | 57034 / Se, 1000 PPM, 125 ml | 060624 | 06/06/2027 | 07/02/2024 / Jaswal | 06/14/2024 / Jaswal | M5962 |
| | | | | Date Opened / | Received Date / | Chemtech |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Opened By | Received By | Lot # |
| Supplier Seidler Chemical | BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L) | Lot # 24B1362001 | _ | - | | |
| | BA-9598-34 / Nitric Acid, | | Date | Opened By 07/05/2024 / | Received By 07/03/2024 / | Lot # |



| 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. | 57092 / U, 1000 PPM, 125 ml | 060724 | 06/07/2027 | 07/29/2024 / Jaswal | 06/11/2024 / Jaswal | M5981 |
| 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 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57040 / Zr, 1000 PPM, 125 ml | 071423 | 07/14/2026 | 07/29/2024 / Jaswal | 06/11/2024 / Jaswal | M5983 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | 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 / | 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 / Received By | Chemtech Lot # |
|-----------------------------|--|---------------------|--------------------|----------------------------|---------------------------------|-------------------|
| Absolute Standards, Inc. | 57082 / Pb, 1000 PPM, 125 ml | 061224 | 06/12/2027 | 08/05/2024 / Jaswal | 08/05/2024 / Jaswal | M6025 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | 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 Standards, Inc. | 58113 / AI, 10000 PPM, 500 ml | 011623 | 01/16/2026 | 08/07/2024 / Jaswal | 01/03/2024 / Jaswal | M6033 |
| | - | | • | | | |
| 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 | 1 - | - | | |
| | BA-9598-34 / Nitric Acid, | | Date | Opened By 08/24/2024 / | Received By 08/01/2024 / | Lot # |



Fax: 908 789 8922

| 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 # |
|-----------------------|---------------------------------------|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | IV-STOCK-12 / ICP-MS TUNING SOLUTION, | U2-MEB734294 | 06/21/2028 | 08/21/2024 / Jaswal | 08/19/2024 / Jaswal | M6055 |
| | 125mL | | | | | |

| 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

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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

Certified Reference Material CRM



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

| | F | בַ ע | ğ (| # t | Z : | Δ. | Ş. | 2 | | Ī | |
|-------------------------------|--------------|---|------------|-------|--------------|------------|-------|------------------------------|---|----------|--|
| | 10:04 | 3 6 | 9 6 | 2 6 | 3 6 | A 8 | 800 | 40.02 | | | |
| | 2 | 3 5 | 3 5 | ۶ (| 3 5 | 3 5 | 3 | 2 | | | |
| | 20.02 | 3 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 | 20.02 | 3 8 | 3 5 | 3 ; | 3 | Т | | | |
| | Nu. | Š |) <u>ç</u> | 3 5 | 5 5 | 7 0 | p , | Dγ | | | |
| | 20.02 | 3 5 5 | 20.02 | 0.02 | 20.02 | 3 8 | 3 | 40.02 | STATISTICS SEEDING | | |
| | 29 | 1 5 | , <u>4</u> | 1 14 | 1 15 | 1 10 | 5 | H | SOUTH | _ | |
| | 40,02 | 60.02 | 20.2 | 20.02 | 20.02 | 8.62 | 3 | A0.02 | AND MANAGEMENT OF THE PARTY OF | race Me | |
| | 20 | Mo | 9H | щM | 3kM | ַ בַ | • | E | | fetals | |
| (T) = Target analyte | 40.02 | 40.02 | 40.2 | <0.02 | 40.01 | 20.02 | | 40.02 | | Verifica | |
| get anal | × | 7 | ď | Pd | ွှ | 2 | : | Z. | | ition | |
| yte | 802 | 40.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.00 | <0000 | | by ICP- | |
| | Sc | Sm | Ru | RЬ | R | Re | 1 | P. | | NS (| |
| | 40.02 | 40.02 | 40.02 | 40.02 | <0.02 | <0.02 | 40.02 | 000 | | ug/mL) | |
| | Ta | S | Sr | Z | Age | 8 | č | S | 200000000 | | |
| | 0.02 | 40.02 | 40.02 | 40.2 | 40.02 | 40.02 | 7.07 | 3 | The second second | | |
| | 11 | Sn | Tm | Ħ | Ħ | Te | 10 | | | | |
| | <0.02 | <0.02 | <0.02 | 40.02 | 40.02 | <0.02 | 20.02 | 5 | | | |
| | Zt | Zn | ĸ | 뀾 | < | U | * | THE PERSON NAMED IN COLUMN 1 | | | |
| | <0.02 | <0.02 | 40.02 | <0.02 | 40.02 | 40,02 | 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).

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

R: 8/5/24

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CERTIFIED WEIGHT REPORT:

Part Number: 57182

Solvent:

24002546

Nitric Acid

Lot#

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

Revenue

1 40.0

Description: Lot Number: 110923 Lead (Pb)

Recommended Storage: **Expiration Date:** 110926 Ambient (20 °C)

Nominal Concentration (µg/mL): NIST Test Number: **6UTB** 10000

Weight shown below was diluted to (mL): Cot 2000.02 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target

IN029 PBD122016A1 RW# Number Conc. (µg/mL) 10000 99.999 38 Purity (%) 0.10 62.5 **3** 32.0006 Weight (g) 32.0040 Weight (g) Conc. (µg/mL) 10001.1 20.0 10099-74-8 0.05 mg/m3 intryns-rat 93 mg/kg 3128

Actual Actual

Uncertainty Expanded

Reviewed By:

Pedro L. Rentas

110923

+/- (µg/mL) CAS#

OSHA PEL (TWA) SDS information

(Solvent Safety Info. On Attached pg.)

OSHA PEL (TWA) LD50 TSIN SRM

 Lead(II) nitrate (Pb) 1.0E7 [1] Spectrum No.1 [17.284 sec]:58182.D# [Count] [Linear]



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

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

| 77, | A 33 | _ | A)(2) | 2 | <u>4</u> | K | 4 | > | ZU,U2 | NO | _ | 70 | 70.05 | Mu | 20.02 | ٤ | 70.02 | L |
|-----|-------|----|-------------|----|---------------|----------|---------------|----------|---------------|----|--------------|----|---------------|----------|------------|------------|-------|----|
| | | | | 1 | } | , | , | , | 5 | 1 | 3 | 7 | 3 | <u> </u> | 3 | ? | 3 | _ |
| Z | A0.02 | Si | 40.02 | S | ∆ 0.02 | Sm | 40.02 | ઋ | 40.02 | Mo | 40,02 | 2 | ∆ 0,02 | පි | 40.02 | S | 40.02 | ğ |
| ~ | 40.02 | Tm | 40.02 | ň | 40,02 | 2 | 40,02 | סי | <u>8</u> | 3H | 6 0.2 | 75 | 40.02 | Ç | 40.02 | ţ. | (A) | Ве |
| 상 | <0.02 | 귤 | 40.2 | Na | 40.02 | 8 | 40.02 | Ы | 6.02 | M | 40,02 | F | 40,02 | S. | A 2 | Š | 20.02 | - |
| < | 40.02 | Ħ | 40.02 | Ą | 40.02 | 잝 | 40.02 | õ | 40.01 | Mg | 40.02 | 5 | A).02 | | A).02 | , % | 8 6 | |
| G | <0.02 | Te | △.02 | S: | A0.02 | æ | 40.02 | \$ | 40.02 | F | A).02 | HO | 40.02 | · 耳 | 8 2 | , <u>C</u> | 40.02 | 8 |
| W | 40,02 | 4 | 40.2 | မွ | <0.02 | 779 | ∆ 0.02 | 3 | 40.02 | Ξ | 40.02 | Ħ | 20.02 | ı Ü | 20.02 | 5 | 20.02 | _ |
| W | ₩02 | 7 | 40.2 | Se | 40.02 | P | ∆ 0.02 | Z | ∆ 0.02 | E | A0.02 | Hf | 40.02 | Ų | <0.02 | <u>a</u> | - | |

Physical Characterization:

(T)= Target analyte

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

Son I Mills

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. *Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in
- the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.

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

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

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

| | NIST SRM | ,2a | | |
|--|---|-------------------------------------|--|-------|
| 12.1 | NIST | 3162a | | |
| 070721 | SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50 | NA | 0 0 | |
| Sarry Sarry : | SDS Information Safety Info. On Attac HA PEL (TWA) | y/m3 | 100 100 100 100 | |
| Lawrence Barry | SDS Informa ent Safety Info. On OSHA PEL (TWA) | 2.5 (F) mg/m3 | 0 0 0 | |
| | (Solven | 16962-40-6 | | |
| W | | 1696 | 180 | |
| Formulated By: | Expanded Uncertainty +/- (µg/mL) | 2.2 | | |
| Nitric Acid | Final Conc. (µg/mL) | 1000.0 | 170 | |
| Solvent: Nitric Acid 40.0 (mL) | Initial Conc. (µg/mL) | 10000.1 | T T | 260 |
| Lot # 20370011 2.0% | Nominal Conc. (µg/mL) | 1000 | 34.693 sec]:57022.D# [Count] [Linear] | 250 |
| 20 Balance Uncertainty Flask Uncertainty | Uncertainty Pipette | 0.084 | 22. D# 140 | 240 |
| 5E-05 0.058 | Initial Vol. (mL) | 200.0 | ej:570 | |
| T] °C) 2000.02 | Dilution Factor | 0.1000 | 30.693 se | 230 |
| 57022 070721 Titanium (Ti) 070724 Ambient (20 °C) 1000 6UTB | Lot Number | 070120 | 1 50 T | 220 |
| as diluted | Part Number | 58122 | Z E | 0 |
| CERTIFIED WEIGHT REPORT: Part Number: 57022 Lot Number: 070721 Description: Titanium (Expiration Date: 070724 Recommended Storage: Ambient (20 Nominal Concentration (µg/mL): 1000 NIST Test Number: 6UTB Volume shown below was diluted to (mL): | pui | 1. Ammonium hexafluorotitanate (Ti) | 1.0E5 5.0E4 2.0E8 1.0E8 1.0E8 2.0E7 | m/z-> |
| CERTIFIED Non | Compound | 1. Ammoni | | |

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):

| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
|------------------|-------|-------|-------|-------|-------|-------|-------|
| | W | n | > | Yb | Y | Zn | Zr |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | T |
| | TP | Те | П | Th | Tm | Sn | Ti |
| | <0.2 | <0.02 | <0.02 | <0.2 | <0.02 | <0.02 | <0.02 |
| | Se | Si | Ag | Na | Sr | S | Ta |
| J/mL) | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| -MS (<i>μ</i> ς | Pr | Re | Rh | Rb | Ru | Sm | Sc |
| by ICP-№ | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.2 |
| ication | ï | S | Os | Pd | Ь | Pt | K |
| Verif | <0.02 | <0.02 | <0.01 | <0.02 | <0.2 | <0.02 | <0.02 |
| letals | Li | Lu | Mg | Mn | Hg | Mo | Nd |
| Trace M | <0.02 | <0.02 | <0.02 | <0.02 | <0.2 | <0.02 | <0.02 |
| | JH | Но | П | 'n | Ъе | La | Pb |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| | Dy | Ēŗ | Eu | PS | Са | Ge | Au |
| | <0.02 | <0.2 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| | рЭ | Ca | Ce | C | Ç | ပိ | Cu |
| | <0.02 | <0.02 | <0.2 | <0.02 | <0.01 | <0.02 | <0.02 |
| | Al | Sp | As | Ba | Be | Bi | В |

(T)= Target analyte

Certified by:

Physical Characterization:

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



^{*} 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 # 070721

All standard containers are meticulously cleaned prior to use.

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

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

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

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

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Certified Reference Material CRM

M.5192 R: 06/17/2

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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

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

| | | 6 | J ! | B | Be | | Z. | As | 9 | 2 | A | | | |
|---------------------|-------|--------|----------|-------|----------|----------|-------|-------|----------|--------|-------|--|-----------|--------|
| | | 20.02 | 0.00 | A 83 | 0.01 | 10.02 | 4 | 0.2 | 20.00 | ے ک | Ø.0. | The statement of the st | | |
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| | | 40.02 | 20.02 | 3 | 0.02 | 20.02 | 3 | 40.02 | 2.03 | 3 | 0.02 | | | |
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| | | 0.02 | 20.02 | 000 | 40.02 | <0.02 | 10.02 | 200 | <0.02 | | <0.02 | | | |
| | | 8 | La Car | , ; | £1 | Į, | E | 5 | Н | ; | 뜌 | | | |
| | | 800 | 40.02 | 1 | 3 | <0.02 | 20.02 | 3 | A).02 | 10.04 | A (3) | | 1 000 | Trace |
| | I | Z | Mo | 176 | Ę | M | Sw | = | Ę | Ē | 1 | | יוכימוי | Aptolo |
| _ | | 3 | - | 7.02 | 3 | <u>@</u> | .0 | 5 | <u>6</u> | 6 | | | ACI | S Sori |
| (T)= Target analyte | 1 | ತ — | | - | د | 2 | 1 | - | 22 | 20 | 3 | | ווכמנ | 100 |
| rget an | Ľ | 4 | 7 | ۲ | 9 | P | S | , ; | \$ | Z | NT. | | 101 | 3. |
| alyte | 20.2 | 3 | A).02 | 20.02 | 0 1 | A).02 | 40.02 | 0 0 | A 93 | 20.02 | 200 | | JY ICT-IV | 201 |
| | 30 | ? | Sm | Ku | , ; | R. | Rh | | 20 | 7 | | | C | 0 / |
| | 20.02 | 3 | <0.02 | <0.02 | 10.02 | 9 | <0.02 | 70.02 | 3 | <0.02 | | | 9/1111 | 2/11/ |
| | la | 3 (| 2 | Sr | 146 | Ş | Ag | 2 | ?: | Se | | | | |
| | 40.02 | 0.02 | A 93 | <0.02 | 10.2 | 3 | 40.02 | 20.02 | 3 | 0.2 | | | | |
| | Ti | 1 1 | S | Tm | 111 | 7 | :: | 10 | 7 | 7 | | | | |
| | <0.02 | 10.04 | 3 | <0.02 | 20.02 | 3 | 40.02 | 20.02 | 5 | 0.02 | | | | |
| | 72 | 1 | 7, | × | 10 | \$ | < | _ | : | ¥ | | | | |
| | <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

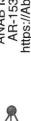
2 of 2

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Certified Reference Material CRM

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

| 5 | | | | | | | ļ | SRM | 3165 | | | - | | | · · · · · · · · · · · · · · · · · · · | | | | |
|--------|--------------------------|---|-------------------|--|---------------------|---|-----------------|---|------------------------------|---------------------------------------|-------|---|-------|-------|---------------------------------------|-------|-------|-------|-------|
| יוממוי | | | 100121 | Ī | 100121 | 1 | : | z v | | | | | | | | | | | |
| 2000 | | 1 | 100 | | 100 | | | 1 pg.) LD50 | orl-rat 630 mg/kg | | | | | | | | | | |
| 2 | | | | | | | uo . | tached | orl-rat 6 | | | | 100 | | | 200 | | | |
| | | B | osito | / | tas | | ormatic | o. Un At TWA) | | | | | F | | | Ñ | | | |
| | | 200 | Giovanni Esposito | 1 /3 | Pedro L. Rentas | | SDS Information | OSHA PEL (TWA) | 1.0 mg/m3 | | | | 0 | | | 00 | | | |
| | | 3 | Gio | B | Ped | | 0) | (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50 | | | | | 06 | | | 190 | | | |
| | | vri. | | , , | | | Š | CAS# | 7803-55-6 | | | | | | | 0 | | | |
| | | Liorannie | ted By: | 14 | d By: | | pa | Inty /mL) | | | | | 8 | | | 180 | | | |
|) | | 五 | Formulated By: | 16 | Reviewed By: | | Expanded | uncertainty +/- (µg/mL) | 2.1 | | | | | | | 0 | | | |
| , | | | Nitric Acid | | | n | - | ıaı vg/mL) | 1000.0 | | | | 70 | | | 170 | | | |
| | | | Nitrio | | | | Ė | Conc. (| 100 | | | | | | | | | | |
| | Solvent: | Nitric Acid | 0.09 | (mL) | | | 1 | Conc. (µg/mL) Conc. (µg/mL) | 10000.4 | - | | | 9 | | | 160 | | | 260 |
| | S | N. T. | | | | | - | | 1 1 | inear | | | | | | | | | |
| | Lot # | 20370011 | 2.0% | | | | i i i i | (mL) Pipette (mL) Conc. (µg/mL) | 1000 | unti [L | | | 50 | | | 150 | | | 250 |
| | _ | 20 | | | certainty | rtainty | | ry Conc | | Con | | | | | | | | | |
| | | | | | Balance Uncertainty | Flask Uncertainty | - Incord | oncertain | 0.084 | 23.D# | | | 40 | | | 140 | | | 240 |
| | | | | | 5E-05 | 0.06 F | <u>.</u> | ol. (mL) F | 300.0 | 34.243 sec]:58023.D# [Count] [Linear] | | | ŀ | | | | | | |
| | | | | | 2 | | | _ | | 3 sec | | | 30 | | | 130 | | | 230 |
| | | S | | (ĵ | | 3000.4 | Citition | Factor | 0.1000 | 2.24 | | | | | | | | | |
| | | 57023 100121 Vanadium (V) | | 100124 Ambient (20 °C) 1000 | m | (mL): | t | Number | 070721 | - C | | | 20 | | | 120 | | | 220 |
|) | | 57023 100121 Vanadiu | | 100124 Ambient 1000 | 6UTB | uted to | | - 1 | 1 1 | , 0 Z | | | | | | | | | |
| | | | | | | Volume shown below was diluted to (mL): | Dart | Number | 58123 | [1] Spectrum No.1 | | | 10 | | | 110 | | | 210 |
| | | Part Number: Lot Number: Description: | | Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): | NIST Test Number: | n pelow | | | | Spec | | | | | | ٦ | | | N |
| | ORT | Part N Lot N Desc | | Expirati lended tration | T Test | shown | | | date (V) | | | | | | | | | | |
| | HT REP | | | concer | N | Volume | | | etavana | 2.0E6 | 1.0E6 | | W/z-> | 2.0E7 | 1.0E7 | ٨ | 5.0E8 | 2.5E8 | m/z-> |
| | WEIGH | | | A ominal | | | | puno | nium Me | ., | , | | Ë | W | , | ~-z/w | 47 | | Ë |
| | CERTIFIED WEIGHT REPORT: | | | ž | | | | Compound | 1. Ammonium Metavanadate (V) | | | | | | | | | | |
| | 핑 | | | | | | | | - - | | | | | | | | | | |

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

| Al |
|----|
|----|

(T)= Target analyte

Certified by:

Physical Characterization:

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



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

^{*} All standard containers are meticulously cleaned prior to use.

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

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

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

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Certified Reference Material CRM

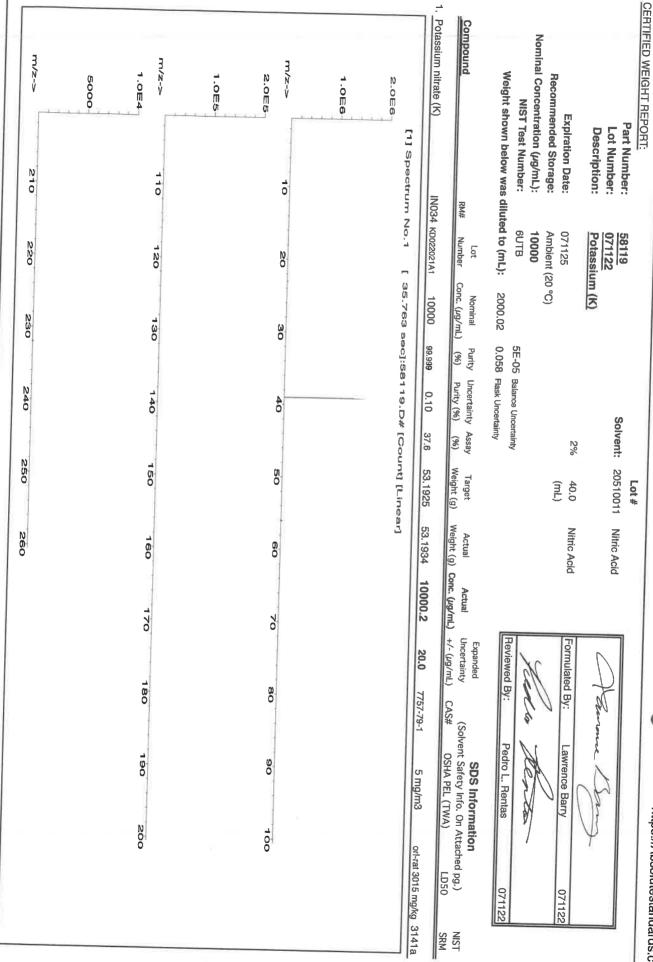
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https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

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

| Physical Characterization: | Al <0.02 Cd <0.02 Dy Sb <0.02 Ca <0.2 Er As <0.2 Ce <0.02 En Ba <0.02 Cs <0.02 Gd Be <0.01 Cr <0.02 Ga Bi <0.02 Cu <0.02 Ga Bi <0.02 Cu <0.02 Ga | |
|----------------------------|---|---|
| 11 1002 41 | <0.002 Hf <0.002 Li <0.002 Ni <0.002 Pr <0.002 Se <0.02 Tb <0.002 W <0.002 <0.002 | Trace Metals Verification by ICP-MS (ug/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).

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

| 4T | 1 |
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Physical Characterization:

(I)= larger analyte

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

Certified by:

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

2 of 2



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 |



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: 6020CAL-1

Lot Number: S2-MEB711244

Matrix: 5% (v/v) HNO3

tr. HF

Value / Analyte(s): 20 µg/mL ea:

Silver, Aluminum, Arsenic, Barium, Beryllium, Calcium, Cadmium, Cobalt, Chromium, Copper, Potassium, Iron, Magnesium, Manganese, Sodium, Nickel, Lead, Antimony, Selenium, Thallium, Zinc Vanadium,

3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE Aluminum, Al | CERTIFIED VALUE 20.01 ± 0.08 μg/mL | ANALYTE Antimony, Sb | CERTIFIED VALUE 20.01 ± 0.12 μg/mL |
|-------------------------|---------------------------------------|-------------------------|---------------------------------------|
| Arsenic, As | 20.01 ± 0.18 μg/mL | Barium, Ba | 20.01 ± 0.11 μg/mL |
| Beryllium, Be | 20.01 ± 0.14 μg/mL | Cadmium, Cd | 20.01 ± 0.11 μg/mL |
| Calcium, Ca | 20.01 ± 0.10 μg/mL | Chromium, Cr | 20.01 ± 0.16 μg/mL |
| Cobalt, Co | 20.01 ± 0.11 μg/mL | Copper, Cu | 20.01 ± 0.10 μg/mL |
| Iron, Fe | 20.01 ± 0.09 μg/mL | Lead, Pb | 20.01 ± 0.11 μg/mL |
| Magnesium, Mg | 19.99 ± 0.10 μg/mL | Manganese, Mn | 20.01 ± 0.10 μg/mL |
| Nickel, Ni | 20.01 ± 0.11 μg/mL | Potassium, K | 20.01 ± 0.10 μg/mL |
| Selenium, Se | 20.02 ± 0.14 μg/mL | Silver, Ag | 20.02 ± 0.09 μg/mL |
| Sodium, Na | 20.01 ± 0.10 μg/mL | Thallium, Tl | 20.01 ± 0.13 μg/mL |
| Vanadium, V | 20.01 ± 0.11 μg/mL | Zinc, Zn | 20.01 ± 0.11 μg/mL |

Assay Information:

| 58 | say information: | | | |
|----|------------------|-------------|--------------|--------------|
| | ANALYTE | METHOD | NIST SRM# | SRM LOT# |
| | Ag | ICP Assay | 3151 999c | 160729 |
| | Ag | Volhard | | 999c |
| | Al | ICP Assay | 3101a | 140903 |
| | Al | EDTA | 928 | 928 |
| | As | ICP Assay | 3103a | 100818 |
| | Ba | ICP Assay | 3104a | 140909 |
| | Ba | Gravimetric | 2405- | 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 |
| | Co | ICP Assay | 3113 | 190630 |
| | Co | EDTA | 928 | 928 |
| | Cr | ICP Assay | 3112a | 170630 |
| | Cu | ICP Assay | 3114 | 121207 |
| | Cu | EDTA | 928 | 928 |
| | Fe | ICP Assay | 3126a | 140812 |
| | Fe | EDTA | 928 | 928 |
| | Fe | Calculated | | See Sec. 4.2 |
| | 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 |
| | Pb | ICP Assay | 3128 | 101026 |
| | Pb | EDTA | 928 | 928 |
| | Se | ICP Assay | 3149 | 100901 |
| | Se | Calculated | | See Sec. 4.2 |
| | TI | ICP Assay | 3158 | 151215 |
| | TI | Calculated | | See Sec. 4.2 |
| | V | ICP 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 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ 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

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

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; inorganic ventures.com; info@inorganic ventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 20, 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

- October 20, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

| Sealed TCT Bag Open Date: | |
|---|--|
|---|--|

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

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

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number:

57056

Solvent:

20510011

Nitric Acid

200

40.0

Nitric Acid

Description: Lot Number:

072122 Barium (Ba)

Certified Reference Material CRM

Riograph 33

Lot #

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

Formulated By: Liovannie Giovanni Esposito appeal 2

072122

Reviewed By: Pedro L. Rentas 072122

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

1. Barium nitrate (Ba)

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 072125

NIST Test Number:

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

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

Certified Reference Material CRM



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

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

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

Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

^{*} 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).

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



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

| Compound | RM# | Lot 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. 4 4 | | | | | | | | | | | | | | |
| m/z-> | 0 | 120 | | 90 | 140 | | 150 | 160 | 071 | 0 | 180 | 190 | | |
| 6.0E4 | | | | | | | | | | | | | | |
| m/z-> | 019 | 220 | | 230 | 240 | | 250 | 260 | | | | | | |

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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 | ioi | by ICP-N | MS (| $(\mu g/m\Gamma)$ | | r | | | | |
|------------|--|--------------|-------------|---------------------------------------|--|------------------|-----------|-----------------|----------|----------|---|--|--|--|--|---|--|---|
| SHEW SHEET | STANSON STANSON | | | | SIGNATURE . | STON SAFETY SAGE | S. Parlie | THE SHARE SHARE | Series . | | Sec. | STREET, STREET | - 100 mm | THE PERSON NAMED IN | THE PERSON | | | |
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| 707 | ర | <0.02 | පි | <0.02 | 片 | <0.02 | Mn | <0.02 | Z | <0.02 | 2 | <0.02 | ž | <0.2 | Ę | <0.02 | ¥9 | 40.02 |
| 100 | Ö | <0.02 | ජි | 40.02 | Ŗ | <0.2 | Hg | 40.2 | م | <0.02 | æ | <0.02 | స | <0.02 | Ę, | <0.02 | ¥ | ₹0.05 |
| 707 | රි | 40.02 | පි | ₹0.02 | 3 | ₹0.02 | Wo | <0.02 | 五 | <0.02 | Sm | <0.02 | S | <0.02 | Sn | <0.02 | 2 | ₹0.02 |
| 707 | ਰੋ | <0.02 | Αū | <0.02 | 2 | <0.02 | PN | <0.02 | × | 40.2 | S | <0.02 | Ta | <0.02 | Ξ | <0.02 | Z | 40.02 |
| | 6.00 6.00 6.00 6.00 6.00 6.00 | | 3 5 5 5 5 5 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | Cd | Cd | Cd | Cd | Cd | Cd -0.02 Dy -0.02 Hf -0.02 Li -0.02 Ca T En -0.02 Ho -0.02 Li -0.02 Ce -0.02 Eu -0.02 in -0.02 Mg -0.02 Cr -0.02 Gd -0.02 Fe -0.02 Mn -0.02 Co -0.02 Ge -0.02 Fe -0.02 Mo -0.02 Cu -0.02 Au -0.02 Fe -0.02 Mo -0.02 | Cd -60.02 Dy -60.02 Hf -60.02 Li -60.02 Ni Ca T En -60.02 Ho -60.02 Lu -60.02 Nh Ca -60.02 Eu -60.02 In -60.02 Mn -60.02 Pd Cr -60.02 Ga -60.02 Fe -60.2 Hg -60.2 Pr Co -60.02 Ga -60.02 La -60.02 Rr -60.02 Rr Cu -60.02 Au -60.02 Pr -60.02 Rr | Cd -6.002 Dy -6.002 Hf -6.002 Li -6.002 Ni -6.002 Ca T En -6.002 Ho -6.002 Lu -6.002 Nh -6.002 Ce -6.002 Eu -6.002 In -6.002 Mg -6.012 Nh -6.002 Cr -6.002 Gd -6.002 Fe -6.02 Mn -6.02 Pd -6.02 Cr -6.002 Gg -6.002 Fe -6.02 Hg -6.02 Pr -6.02 Cu -6.002 Au -6.002 In -6.002 R -6.002 Cu -6.002 Au -6.002 Ph -6.002 R -6.002 | Cd -6.002 Dy -6.002 Hf -6.002 Li -6.002 Ni -6.002 Pr Ca T Ea -6.002 Ho -6.002 Lu -6.002 Nb -6.002 Rc Ce -6.002 Eu -6.002 Ir -6.002 Mn -6.002 Rb -6.002 Rb Cr -6.002 Ga -6.002 Fe -6.02 Hg -6.02 Pr -6.02 Ru Co -6.002 Ga -6.002 La -6.002 Rr -6.002 Rr Co -6.002 Ga -6.002 Pr -6.002 Rr -6.002 Rr Cu -6.002 Au -6.002 Pr -6.002 Rr -6.002 Sr | Cd -0.02 Dy -0.02 Hf -0.02 Li -0.02 Ni -0.02 Pr -0.02 Ca T Ba -0.02 Ho -0.02 Lu -0.02 Nb -0.02 Rb -0.02 Ce -0.02 Bu -0.02 Ir -0.02 Mg -0.01 Os -0.02 Rb -0.02 Cr -0.02 Ga -0.02 Mn -0.02 Pr -0.02 Ru -0.02 Cr -0.02 Ga -0.02 Hg -0.2 Pr -0.02 Ru -0.02 Cr -0.02 Ga -0.02 Hg -0.2 Pr -0.02 Ru -0.02 Cu -0.02 Au -0.02 Nd -0.02 Rr -0.02 Sr -0.02 Cu -0.02 Au -0.02 Nd -0.02 Rr -0.02 Sr -0.02 | Cd -d002 Dy -d002 Hf -d002 Li -d002 Ni -d002 Re -d002 Si Ca T Ea -d002 Ho -d002 Lu -d002 Nb -d002 Re -d002 Si Ca -d002 Ea -d002 Hr -d002 Mn -d002 Rh -d002 Na Cr -d002 Ga -d002 Hg -d02 Pr -d002 Ru -d002 Na Co -d002 Ga -d002 Hg -d002 Rr -d002 Sr -d002 Sr Co -d002 Ga -d002 Hg -d002 Rr -d002 Sr -d002 Sr -d002 Sr Cu -d002 Au -d002 Nd -d002 Rr -d002 Sr -d002 Sr -d002 Sr -d002 Ta | Cd -0.02 Dy -0.02 Hf -0.02 Li -0.02 Ni -0.02 Pr -0.02 Se -0.02 Ca T Eu -0.02 Ho -0.02 Lu -0.02 Nb -0.02 Rb -0.02 Si -0.02 Ce -0.02 Eu -0.02 In -0.02 Mn -0.02 Rb -0.02 Na -0.02 Ca -0.02 Gd -0.02 Ir -0.02 Mn -0.02 Rb -0.02 Na -0.02 Ca -0.02 Ga -0.02 Hg -0.02 Ru -0.02 Sr -0.02 Ca -0.02 Ga -0.02 Hg -0.02 Rr -0.02 Sr -0.02 Ca -0.02 Au -0.02 Nd -0.02 Rr -0.02 Sr -0.02 Ca -0.02 Au -0.02 Rr -0.02 Sr | Cd 4002 Dy 4002 H 4002 Li 4002 Ni 4002 Pr 4002 Se 402 Th Ca T Ea 4002 Ha 4002 Lu 4002 Nb 4002 Rb 4002 Tr Ca 4002 Eu 4002 Ha 4002 Pd 4002 Rb 4002 Tr Cr 4002 Ga 4002 Hg 402 Pr 4002 Ru 4002 Tr Cr 4002 Ga 4002 Hg 402 Pr 4002 Ru 4002 Tr Cr 4002 Ga 4002 Hg 402 Pr 4002 Sr 4002 Sr 4002 Cr 4002 Au 4002 Rr 4002 Rr 4002 Sr 4002 Sr 4002 Sr |

(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.

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

SRM

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

Lot # 061522

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):

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

Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 061522

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

the preparation of all standards.

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

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

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:

| ٠. | | |
|-----------------|--|-----------------------------|
| 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) |
| | | _ |
| 1 | arget | Weight (g) |
| | Assay | 9 |
| 1 | unity Unkertality Assay | runty (%) |
| Dringer | runcy (85) | R |
| Nominal | Conc (un/ml) | COLLEG (ARRYTHL) |
| 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 | no Em/gm c | 1409-09-0 | Ш | | | | | | | | | | |
|------------|-------------------------|--|----------------|--------------|------------------------------------|------------|----------------------------|-------|-------------|----------|---------------|---------------|------|-----------|
| | | | 20.0 7430.80.6 | | 0.10 100.0 50.0034 50.0111 10001.5 | 50.0111 | 50.0034 | 100.0 | 0.10 | 98.985 | 10000 | 3 2224912-500 | IN34 | Iron (Fe) |
| SKE | LUSO | COLOR FEET (TWA) | L COLON | | | | | | | | | | | |
| 2 | (34) | OCHA DEI (TAKA) | CAC# | (m/m/) -/+ | Conc. (vo/ml.) | Weight (a) | Weight (g) | (%) | Purity (%) | <u>8</u> | Conc. (µg/mL) | Number | KMH | |
| Į. | 7 00 00 | Uncertainty Assay Target Actual Actual Uncertainty (Solvient Safesy Info On Actual | (Soh | Uncertainty | Actual | Actual | y Uncertainty Assay Target | Assay | Uncertainty | Purity | Nominal | 5 | | Compound |
| | | | | | | | | | | - | - | - made | | |

| | | 110-10 SEE4912-000 | 2000 | 99.985 | 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 |
|-------|------------------|---|------------------|--------|------|-------|---------|-----------------|---------|------|-----------|---------|-------------------------|
| 2.064 | 1) Spectrum No.1 | [1] Spectrum No.1 [30.763 sec]:58126.D# [Count] [Linear] | [Count] [Linear] | | | | | _ | | | | | |
| 1.054 | | | | | | | | _ | | | | | |
| m/z-> | 10-1 | 50 | 0 8 | | -6 | | .00 | -09 | 02 | | 08 | . 06 | 100 |
| 5.0E7 | 110 | 120 | 130 | | 140 | | 150 | 160 | 170 | | 180 | 0 61 | 500 |
| S.0E7 | 0.6 | | | | | | | | | | | | |
| | 1 | 220 | 230 | | 240 | | 250 | 260 | | | | | |

Certified Reference Material CRM





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

| | | | | | | | Trace Me | stals | Verificat | ion b | y ICP-MS | gu) | /mL) | | | | | | |
|---------|--------------|----|--------------|----|-------|----|--------------|-------|--------------|-------|------------------------|-----|-------|----|--------------|----------|--------------|----------|-------|
| STORY . | 000 | | | | 200 | | 404 | | | | NAME OF TAXABLE PARTY. | | | | | | | | |
| æ | 40.02 | 3 | 70.05 | ŝ | 70'0> | Ē | 70102 | 3 | Z0702 | ž | <0.10 | £ | Z070≥ | š | 402 | e | 40.02 | * | 40.02 |
| S. | <0.02 | రే | 4 02 | 山 | <0.02 | He | 40.02 | 3 | <0.02 | ź | <0.02 | Re | <0.02 | ૹ | 40.02 | <u>1</u> | <0.02 | n | <0.02 |
| As | Ø.2 | ප | <0.02 | 큡 | <0.02 | 멸 | <0.02 | Mg | <0.01 | ő | <0.02 | 꿆 | <0.02 | Ag | <0.02 | F | <0.02 | > | <0.02 |
| Ba | 40.02 | ඊ | Ø.02 | 3 | <0.02 | ㅂ | 40.02 | Ma | <0.10 | 몺 | <0.02 | 8 | <0.02 | Š | 40.2 | Ē | <0.02 | χ. | <0.02 |
| Be | ₩ | ŏ | 40.05 | පී | <0.02 | £ | 40.2 | Hg | 40.2 | Δ. | <0.02 | Ru | <0.02 | Ŗ | <0.02 | 뎚 | <0.02 | X | <0.02 |
| Ä | 40.02 | රි | Ø.10 | ප | 40.10 | ጟ | 40.02 | Mo | 40.02 | £ | <0.02 | Sm | <0.02 | S | <0.02 | Sn | <0.02 | Z | <0.05 |
| В | <0.02 | ರ | <0.10 | Απ | <0.02 | £ | <0.02 | R | <0.02 | M | <0.2 | ß | <0.02 | Ta | <0.02 | F | <0.02 | Z | <0.02 |

(T)= Target analyte

Physical Characterization:

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



Certified by:

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

All standard containers are meticulously cleaned prior to use.

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

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

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

2 of 2

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

Description: Lot Number:

58119 120822 Potassium (K)

Solvent: 20510011 Nitric Acid

Lot #

Javanva

アイクラクスで

60.0 <u>a</u>

2%

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000 Ambient (20 °C) 120825

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

3000.4

5E-05 Belance Uncertainty

0.06 Flask Uncertainty

Nitric Acid

Formulated By:

Giovanni Esposito

120822

Reviewed By:

Pedro L. Rentas

120822

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

| m/z-y | 5000 | m/z-> | 1.0E5 | m/z-> | 1.000 | 2.016 |
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| | | 190 | | 0 | | |
| | | A. | | | | |
| | | 200 | | 100 | | , |
| | | | | | | |

Lot # 120822

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

| | Bi Be | |
|----------------|--|----------|
| | 4000 4000 4000 4000 4000 | |
| | 585888 8 | |
| Œ | 40.02 40.02 40.02 40.02 40.02 40.02 | |
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| | \$ | |
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| | NA BA BA L L | etals |
| (T) = Tar | 40.00 40.00 40.00 40.00 40.00 40.00 40.00 | Verifica |
| Target analyte | K P P Z O K N | ation |
| alyte | 4022 4022 4022 4022 7 | by ICP- |
| | S B B B B B | SW |
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| | Ja Sr Na Se Se | |
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| | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | |

Physical Characterization:

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

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. *Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.

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

Lot # 120822



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-SPK-1

Lot Number:

T2-MEB721963

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

2 000 µg/mL ea:

Aluminum,

Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Manganese,

Nickel,

Vanadium,

Cabalt

Zinc,

Cobalt,

250 µg/mL ea:

Copper,

200 µg/mL ea: Chromium,

50 µg/mL ea:

Beryllium,

Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE Aluminum, Al | CERTIFIED VALUE 2 000 ± 7 µg/mL | ANALYTE Barlum, Ba | CERTIFIED VALUE 2 000 ± 9 µg/mL |
|-------------------------|------------------------------------|-----------------------|------------------------------------|
| Beryllium, Be | 50.00 ± 0.26 μg/mL | Chromium, Cr | 200.0 ± 1.1 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 | Manganese, Mn | 500.0 ± 2.0 μg/mL |
| Nickel, Ni | 500.0 ± 2.2 μg/mL | Silver, Ag | 50.00 ± 0.22 μg/mL |
| Vanadium, V | 500.0 ± 2.2 μg/mL | Zinc, Zn | 500.0 ± 2.2 μg/mL |

Density:

1.070 g/mL (measured at 20 ± 4 °C)

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 |
| Ва | ICP Assay | 3104a | 140909 |
| Ba | Gravimetric | | See Sec. 4.2 |
| Be | ICP Assay | 3105a | 090514 |
| Be | Calculated | | See Sec. 4.2 |
| Co | ICP Assay | 3113 | 190630 |
| Co | EDTA | 928 | 928 |
| Cr | ICP Assay | 3112a | 170630 |
| Cu | ICP Assay | 3114 | 121207 |
| Cu | EDTA | 928 | 928 |
| Fe | ICP Assay | 3126a | 140812 |
| Fe | EDTA | 928 | 928 |
| Mn | ICP Assay | 3132 | 050429 |
| Mn | EDTA | 928 | 928 |
| Ni | ICP Assay | 3136 | 120619 |
| Ni | EDTA | 928 | 928 |
| V | IC Assay | 3165 | 160906 |
| V | EDTA | 928 | 928 |
| Zn | ICP Assay | 3168a | 120629 |
| Zn | EDTA | 928 | 928 |

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRMRM}, 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 (1) = $U_{CRM/RM} \approx k (u^2_{cher} + v^2_{bb} + v^2_{lts} + v^2_{tr})^{1/2}$

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{\frac{1}{2}}$ 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

Characterization of CRM/RM by One Method

Certifled Value, $\mathbf{X}_{\text{CRM/RM}}$, where one method of characterization is used is the mean of individual results:

 $X_{CRM/RM} = (X_R) (u_{ohar} a)$

X_a = mean of Assay Method A with

Uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

 $\mathbf{u}_{\mathrm{char}\,\mathbf{u}}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

uite = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 27, 2022

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

11.2 Lot Expiration Date

- July 27, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

| Sealed TCT Bag Open Date: | |
|---|--|
|---|--|

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Paul R. Lines

CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

CERTIFICATE OF ANALYSIS

Date: 8/3/2022

MS631 MS632 MS633 MS634

Lot No 820803

Hydrogen Peroxide, ACS

Reagent Grade

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

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

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

Gina M. Rambo-Office Manager



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com M5657

A: 8/29/22

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CLPP-SPK-4

Lot Number:

T2-MEB721144

Matrix:

3% (v/v) HNO3

Value / Analyte(s):

100 µg/mL ea:

Antimony,

50 μg/mL ea:

Cadmium,

Thallium,

40 µg/mL ea:

Arsenic,

20 µg/mL ea:

Lead,

10 µg/mL ea:

Selenium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Antimony, Sb CERTIFIED VALUE 99.9 ± 0.8 µg/mL

ALUE ANALYTE
L Arsenic, As

CERTIFIED VALUE

40.00 ± 0.25 μg/mL

Cadmium, Cd

49.96 ± 0.22 µg/mL

Lead, Pb

19.99 ± 0.10 µg/mL

Selenium, Se

10.00 ± 0.06 µg/mL

Thallium, TI

49.96 ± 0.32 µg/mL

Density:

1.014 g/mL (measured at 20 ± 4 °C)

Assay Information:

| ANALYTE As | METHOD ICP Assay | NIST SRM# traceable to 3103a | SRM LOT# R2-AS691113 |
|---------------|---------------------|------------------------------|-------------------------|
| Cd | ICP Assay | 3108 | 130116 |
| Cu | • | | 130116 |
| Cd | EDTA | 928 | 928 |
| Cd | Calculated | | See Sec. 4.2 |
| Pb | ICP Assay | 3128 | 101026 |
| Pb | EDTA | 928 | 928 |
| Pb | Calculated | | See Sec. 4.2 |
| Sb | ICP Assay | 3102a | 140911 |
| Se | ICP Assay | 3149 | 100901 |
| Se | Calculated | | See Sec. 4.2 |
| TI | ICP Assay | 3158 | 151215 |
| 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 | Characterization of CRM/RM by One Method 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: |
| $X_{CRM/RM} = \sum_{i} (w_i) (X_i)$ | $X_{CRM/RM} = (X_a) (u_{char} a)$ |
| X _i = mean of Assay Method i with standard uncertainty u _{char i} | X _a = mean of Assay Method A with |
| \mathbf{w}_{i} = the weighting factors for each method calculated using the inverse square of the variance: | uchar a = the standard uncertainty of characterization Method A |
| $w_i = (1/u_{char})^2 / (\Sigma(1/(u_{char})^2))$ | |
| CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{its} + u^2_{ts})^{1/3}$ | CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/4}$ |
| k = coverage factor = 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 | uchar a = the errors from characterization |
| u _{bb} = bottle to bottle homogeneity standard uncertainty | ubb = bottle to bottle homogeneity standard uncertainty |
| ults = long term stability standard uncertainty (storage) | utte = long term stability standard uncertainty (storage) |

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.

ute = transport stability standard uncertainty

4.1 Thermometer Calibration

uts = transport stability standard uncertainty

 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 $20^{\circ} \pm 4^{\circ}$ 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; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 07, 2022

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

11.2 Lot Expiration Date

- July 07, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

| Sealed TCT Bag Open Date: | |
|---|--|
|---|--|

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control DD978hi.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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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

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Part # 58024



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

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| | <0.02 | <0.02 | <0.02 | 40.02 | 40,02 | 40.02 | <0.02 | | g/mL) | |
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(I)= larget analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

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Certified Reference Material CRM

R: 10/23/23 M5697



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| CERTIFIED WEIGHT REPORT | | | | | | Lot # | Solvent: | | | | | | |
|---|------------|---------------------|----------|-----------|---------------------|--------------|--|-------------|----------------|------------|--|-------------------|------|
| Part Number: Lot Number: | | 58029 102523 | | | | 24002546 | Nitric Acid | | | | Ι, | | |
| Description: | | Copper (Cu) | ব | | | | | | | 1000 | Commence of the Commence of th | | |
| | | | | | | 2.0% | 40.0 | Nitric Acid | Formulated By: | | Benson Chan | 102523 | |
| Expiration Date: | •• | 102526 | | | | | (ml.) | | ١ | 2 | 6 | | |
| Recommended Storage: | | Ambient (20 °C) | (၃ | | | | | | 1 | * | N. | | |
| Nominal Concentration (µg/mL): | | 1000 | | | | | | | K | S. S. | Crea ! | | |
| NIST Test Number: | | 6UTB | | 5E-05 | Balance Uncertainty | nly | | 1 | 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 | Lot | 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. (ug/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 | 6.5 | 10031-43-3 | 1 ma/m3 | ori-rat 794 mo/kg | 3114 |
| , | | | | | | | | | | | l | | |
| | | | | | | | | | | | | | |

| 1.0E6 | [1] Spectrum No.1 | L'ON L'O | | 422 sec]:5 | [33.422 sec]:58029.D# [Count] [Linear] | Sound (Lir | near] | 1000 | | | | |
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| 1.067 | | | | | | | | | | | | |
| <-Z/L | 210 | | 220 | 230 | 240 | 250 | 860 | | | | | |

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Certified Reference Material CRM

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

| Verification by ICP-MS (μg/mL) | Ni <0.02 Pr <0.02 Se <0.2 Tb <0.02 W | 40.02 Nb <0.02 Re <0.02 Si <0.02 Te <0.02 U <0.02 | Os <0.02 Rb <0.02 Ag <0.02 T1 <0.02 V | Pd <0.02 Rb <0.02 Na <0.2 Th <0.02 Yb | P <0.02 Ru <0.02 Sr <0.02 Tm <0.02 Y | Pt <0.02 Sm <0.02 S <0.02 Sn <0.02 Zn | K <0.2 Sc <0.02 Ta <0.02 Ti <0.02 Zr |
|--------------------------------|--|---|---|---------------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|
| Trace | L | 0.02 | _ | <0.02 | | _ | |
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| | <0.02 | ₹0:05 | 40.2 | <0.02 | <0.01 | <0.02 | <0.02 |
| | IA | SP PS | As | Ba | æ | Ä | m |

(T) = Target analyte

Physical Characterization:

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





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

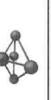
Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

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

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Certified Reference Material CRM

A: 10/23/23 4 M5698



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| | | 8 | 24002546 | Nitric Acid | | | | |
|---|-----------|---------------------|-------------|---------------|--|--|--|---------|
| - 1 mm | | | 2.0% | | | | | |
| man — V | | | 2.0% | | | The state of the s | | |
| | | | 2.0% | | | Charles Contraction of the Contr | The state of the s | |
| | | | | 60.0 | Nitric Acid | Formulated By: | Benson Chan | 102623 |
| | | | | (mL) | | 1 | 9 | |
| | | | | | | 1 | The state of the s | |
| Nominal Concentration (AgmL): 1000 | | | | | | Learly | Kena | |
| NIST Test Number: 6UTB | 5E-05 | Balanca Uncertainty | | | | Reviewed By: | Pedro L. Rentas | 102623 |
| Volume shown below was diluted to (mL): 3000.41 (| 0.058 | Flask Uncertainty | | | , | | | |
| | | | | | | Expanded | SDS Information | |
| Part Lot Dilution | Initial | Uncertainty | Nominal | Initial | Final | Uncertainty | (Solvent Safety Info. On Attached pg.) | ed pg.) |
| Compound Number Number Factor V | Vol. (mL) | | nc. (ug/mL) | Conc. (ug/mL) | Pipette (mL) Conc. (μg/mL) Conc. (μg/mL) Conc. (μg/mL) +/- (μg/mL) | | CAS# OSHA PEL (TWA) | LD50 |

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

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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 | МS (µ g | J/mL) | | | | | | |
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| As | <0.2 | ర | <0.02 | 超 | <0.02 | ų | <0.02 | Mg | ₹0.01 | ő | <0.02 | 뙶 | <0.02 | Ag | <0.02 | F | <0.02 | > | 40.02 |
| Ba | <0.02 | ర | <0.02 | 3 | <0.02 | H | <0.02 | Mn | H | Pd | <0.02 | Rb | <0.02 | Na B | <0.2 | T. | <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 | Sr | <0.02 | Ę | <0.02 | × | <0.02 |
| Bi | ₹0.02 | රි | <0.02 | පි | <0.02 | r _a | <0.02 | Mo | 40.02 | Z, | <0.02 | Sm | <0.02 | S | ₹0.02 | Sn | <0.02 | Zn | <0.02 |
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| | | | | | | | | | | | | | | | | | | | 1 |

(T) = Target analyte

Physical Characterization:

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

the balances that are calibrated with weights traceable to NIST (see above).

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

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

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

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

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

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

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| | <0.02 | 40.02 | <0.02 | <0.02 | A).02 | 40.02 | 40.02 | | | |

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

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



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

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

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

| | [| 171 | <u></u> | (22) | 5> | Sb | 5> | | | |
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(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.
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- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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

24002546 Nitric Acid

2.0%

Nominal Concentration (µg/mL):

NIST Test Number:

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

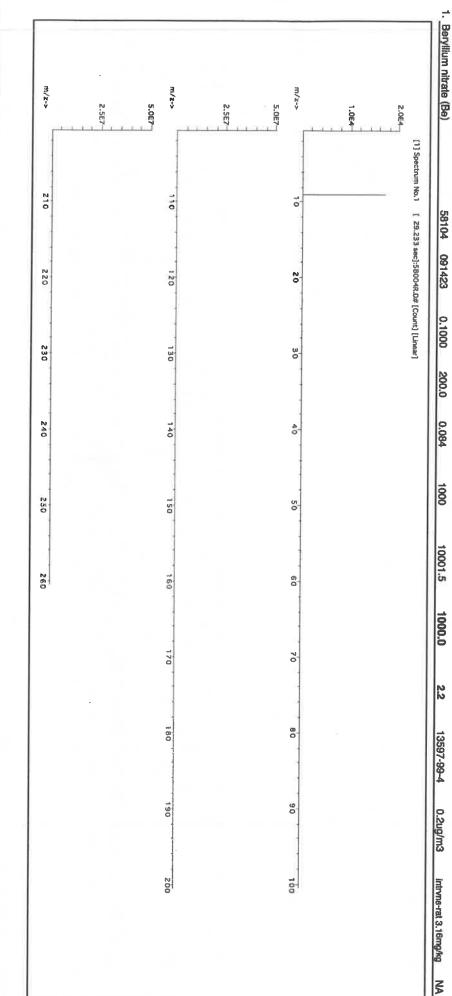
102523

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



Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

| | | | | | | | Trace M | etals | Verifical | tion | by ICP-M | J) S | g/mL) | | | | | | |
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(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 All standard containers are meticulously cleaned prior to use. the preparation of all standards.

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

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(I) = larget analyte

Physical Characterization:

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

Certified by:

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Certified Reference Material CRM

R: 02109124





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

| | | | | | | TANK BURNE | 10000 | CHICAGO CONTROL CONTRO | URCH LABILLY | ianioc) | (Solvent Safety Into, On Attached pg.) | rttached pg.) | 202 |
|---|--------|--------|------------|-----------|----------------|--|---------------|--|--------------|------------|---|--|------|
| Compound | Number | Number | Factor | Vol. (mL) | Pipette (mL) C | conc. (ug/ml.) | Conc. (µg/mL) | Conc. (ug/ml.) | +/- (ng/mL) | CAS# | Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) | 1050 | SRM |
| | | | | | | | | | | | | | |
| Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0 | 58127 | 050923 | 0.1000 | | 0.084 | 1000 | 10000 | 100001 100001 | 9.0 | 10008.000 | 000 | 700 | - 5 |
| | | | | | | | 20000 | | 7:5 | 100c0-22-9 | O.UZ ING/ITI3 | STEE 10020-22-9 0.02 mg/ms on-rat 691 mg/kg 3113 | 3113 |
| | | | | | | | | | | | | | |
| 2000 | Z Ezz | 1.0 | 9 4 DAG 45 | Cau. Co | CHARLE WO | [1] Specifical No.1 Cat. 04.04% pool: nacotation of the partition of the p | | | | | | | |

| 1.0E6 | 5.0E5 | m/z-> | 5.0E7 | 1.0E8 | 5.0E7 |
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| | | .0 | | 140 | |
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| | | . O | | 160 | |
| | | | | 170 | |
| | | 02 | | | |
| | | 80 | | 160 | |
| | | 00 | | 180 | |
| | | 100 | | 200 | |

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 | ig/mL) | | | | | | |
|----|--------------|----|--------------|-----|----------------|----|--|------------------|---|--------|---------------|---------|-----------------|------------------------|---------------------|----------------|-------|---------------------|-----------------|
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(T)= Target analyte

Physical Characterization:

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



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Lot # 091923

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Certified Reference Material CRM

M5801



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

CERTIFIED WEIGHT REPORT: 1. Arsenic (As) Compound Nominal Concentration (µg/mL): M/2-> m/z-> -z/m 5.OE4 2.5E4 Recommended Storage: 1.0E5 2.0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

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Physical Characterization:

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

Certified by:



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

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(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.

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

2 of 2

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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

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(I) = larget analyte

Physical Characterization:

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

Certified by:

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the preparation of all standards.

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Certified Reference Material CRM

109/24

M5817

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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 | 2.5E5 | 5.0E5 | 1000 | 2000 |
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Physical Characterization:

(1)= larger analyte

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

Certified by:

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Certified Reference Material CRM

109124 M.5818

Solvent: 24002546 Nitric Acid

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

CERTIFIED WEIGHT REPORT:

Part Number:

Lot Number: Description: 57014 122023

Silicon (SI)

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

Expiration Date:

122026

2%

40.0 (mL)

Nitric Acid

Formulated By:

Aleah O'Brady

122023

122023

Areah o Brasky

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

| | | | | | | 10000 | 12000 | | | 00000 | 3 3 16 3 | | |
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| 200 | | NUMP NUMBER Conc. (143/ml.) (%) Purity (%) (%) Weight (a) Weight (b) Conc (143/ml.) CAS# OCUA DCI (74/ml.) | HOACH | +1/1 (12/11) | Come (sector) | Weight (a) | Weight (a) | 8 | 8) All a | 98 | Conc. (Ja/mL) | KM# Number | ALI PARTICION DE LA CONTROL DE |
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| * | 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 |
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| 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 |
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Part # 57014

1 of 2



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(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

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

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Certified Reference Material CRM

2 02/na

ング

Solvent: 24002546

Nitric Acid

F Lot #

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: 58030

Description:

111623 Zinc (Zn)

Ambient (20 °C) 111626

Expiration Date:

Nominal Concentration (µg/mL): Recommended Storage:

NIST Test Number:

BTU9 1000

5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Weight shown below was diluted to (mL):

3000.4

5

Nominal

Purity

Uncertainty Assay

Target

Actual

Actual

Uncertainty

Expanded

<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

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(I) = larget analyte

Physical Characterization:

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

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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



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

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Physical Characterization:

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

Certified by:

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



Certified Reference Material CRM

Lot #

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

 Nickel(II) nitrate hexahydrate (Ni) Nominal Concentration (µg/mL): m/z-> Weight shown below was diluted to (mL): Recommended Storage: NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 210 110 0 N033 NIM052023A1 RM# 6UTB 57028 041124 1000 Ambient (20 °C) 041127 Nickel (Ni) Number <u>6</u> 220 20 [12.374 sec]:58128.D# [Count] [Linear] Conc. (µg/mL) Nominal 249.85 100 230 130 30 0.002 Flask Uncertainty 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) 0.10 240 140 40 **Solvent:** 24002546 8 2% 250 150 Weight (g) 50 1.2369 Target 1 5.0 Nitric Acid Nitric Acid Weight (g) 1.2369 Actual 260 160 60 Conc. (µg/mL) 1000.0 Actual 170 0 Reviewed By: +/- (µg/mL) Formulated By: Uncertainty Expanded 2.0 180 80 13478-00-7 CAS# (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Brian Geddes 190 90 OSHA PEL (TWA) SDS Information 1 mg/m3 200 100 orl-rat 1620 mg/kg 041124 041124 3136 NIST SRM

| | | | | | | | | Ггасе Ме | tals | Verifica | tion | by ICP-I | Sh (| μg/mL) | | | | | | |
|----|---------|------|---|-------|----|-------|-----|----------|------|--------------------|------|----------|---------|--------|-----|-------|----|-------|----|-------|
| > | 1 | | 1 | 40.02 | Dy | <0.02 | HH. | <0.02 | 11 | <0.02 | Z. | T | Pr | <0.02 | Se | <0.2 | 4T | <0.02 | * | <0.02 |
| Sb | 6 <0.02 | 2 Ca | | <0.2 | 퍾 | <0.02 | Но | <0.02 | Ē | <0.02 | \$ | <0.02 | Re | 40.02 | S: | <0.02 | Te | <0.02 | ď | 40.02 |
| ≥ | | | _ | <0.02 | 臣 | <0.02 | F | <0.02 | Mg | 40.01 | ဝွ | <0.02 | R. | <0.02 | Ag | <0.02 | ∄ | <0.02 | < | 40.02 |
| Ba | | | | <0.02 | වු | <0.02 | ۲ | <0.02 | M | <0.02 | Pd | <0.02 | RЪ | <0.02 | Na. | 40.2 | Ħ | <0.02 | \$ | 40.02 |
| Ве | _ | | | <0.02 | G | <0.02 | Fe | <0.2 | Hg | 40.2 | Þ | <0.02 | Ru | 40.02 | S. | <0.02 | Tm | <0.02 | × | 40.02 |
| Bi | | | | <0.02 | දු | <0.02 | La | <0.02 | Mo | <0.02 | ¥ | <0.02 | Sm | 40.02 | S | <0.02 | Sn | <0.02 | Zn | 40.02 |
| В | H | | r | <0.02 | Au | <0.02 | Pв | <0.02 | M | <0.02 | × | <0.2 | Sc | <0.02 | Ta | <0.02 | 11 | <0.02 | Zr | <0.02 |
| | | | | | | | | | | (T) - Towas analys | | that | | | | | | | | |

= 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

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 | | | | | lie ie ii | _ | |
| 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 | No. | 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 | | _ | |

| | | | | | | | I race M | 1etals | Verifica | lion | oy ICP-M | S (1) | g/mL) | | | | | | |
|----|-------|-----|-------|----|-------|----|----------|--------|----------|------|----------|-------|-------|----|-------|----|-------|----|-------|
| Al | <0.02 | CG | <0.02 | Dγ | <0.02 | HH | <0.02 | 11 | <0.02 | Z. | <0.02 | Pr | <0.02 | Se | H | 16 | 40.02 | W | 40,02 |
| SЪ | <0.02 | ದ್ದ | <0.2 | 퍜 | <0.02 | н | <0.02 | Į. | <0.02 | ₽ | <0.02 | Re | 40.02 | S: | <0.02 | Te | <0.02 | U | <0.02 |
| As | <0.2 | ಕಿ | <0.02 | 핃 | <0.02 | Ħ | <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 | ŀ | <0.02 | Mn | <0.02 | Pd | 40.02 | ₽. | <0.02 | Na | <0.2 | Ħ | <0.02 | ታ | <0.02 |
| Ве | 40.01 | ť | 40.02 | Ga | <0.02 | F | <0.2 | Hg | A02 | P | <0.02 | Ru | 40.02 | Sr | <0.02 | Tm | <0.02 | ¥ | <0.02 |
| Bi | 40.02 | င္ပ | <0.02 | ଦୁ | <0.02 | Ľ | <0.02 | Mo | <0.02 | 7 | <0.02 | Sm | 40.02 | S | <0.02 | Sn | 40.02 | Zn | <0.02 |
| В | <0.02 | Cι | <0.02 | Au | <0.02 | Рь | <0.02 | M | <0.02 | × | 40.2 | Sc | <0.02 | Ta | <0.02 | Ħ | <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.

- * 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 (AI) | ≤ 40.0 ppb | < 1.0 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 2.0 ppb |
| Trace Impurities – Barium (Ba) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Beryllium (Be) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Bismuth (Bi) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Boron (B) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Cadmium (Cd) | ≤ 50 ppb | < 1 ppb |
| Trace Impurities ~ Calcium (Ca) | ≤ 50.0 ppb | < 0.2 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 30.0 ppb | < 1.0 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Copper (Cu) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Gallium (Ga) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Germanium (Ge) | ≤ 20 ppb | < 10 ppb |
| Trace Impurities - Gold (Au) | ≤ 20 ppb | < 5 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | < 50 ppb |
| Trace Impurities - Iron (Fe) | ≤ 40.0 ppb | < 1.0 ppb |
| Trace Impurities - Lead (Pb) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities – Lithium (Li) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Magnesium (Mg) | ≤ 20 ppb | < 1 ppb |
| Trace Impurities - Manganese (Mn) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Nickel (Ni) | ≤ 20.0 ppb | < 5.0 ppb |

>>> Continued on page 2 >>>





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

| Test | Specification | Result |
|-------------------------------------|---------------|------------|
| Trace Impurities - Niobium (Nb) | ≤ 50.0 ppb | < 1.0 ppb |
| Trace Impurities – Potassium (K) | ≤ 50 ppb | < 10 ppb |
| Trace Impurities – Silicon (Si) | ≤ 50 ppb | < 10 ppb |
| Trace Impurities - Silver (Ag) | ≤ 20.0 ppb | < 1.0 ppb |
| Trace Impurities - Sodium (Na) | ≤ 150.0 ppb | < 5.0 ppb |
| Trace Impurities - Strontium (Sr) | ≤ 30.0 ppb | < 1.0 ppb |
| Trace Impurities - Tantalum (Ta) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities – Thallium (TI) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Tin (Sn) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Titanium (Ti) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Vanadium (V) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Zinc (Zn) | ≤ 20.0 ppb | < 1.0 ppb |
| Trace Impurities - Zirconium (Zr) | ≤ 10.0 ppb | < 1.0 ppb |
| Particle Count - 0.5 µm and greater | ≤ 60 par/ml | 3 par/ml |
| Particle Count - 1.0 µm and greater | ≤ 10 par/ml | 1 par/ml |

Nitric Acid 69% **CMOS**





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

Test

Specification

Result

For Microelectronic Use

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



Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

Certificate of Analysis M5976, M5977 R : 02/22/24 P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGMO1

Lot Number:

T2-MO720876

Matrix:

H2O

tr. NH40H

Value / Analyte(s):

1 000 µg/mL ea:

Molybdenum

Starting Material:

Ammonium Molybdate

Starting Material Lot#:

2361

Starting Material Purity: 99.9893%

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Value:

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

Density:

1.000 g/mL (measured at 20 ± 4 °C)

Assav Information:

Assay Method #1

998 ± 4 µg/mL

ICP Assay NIST SRM 3134 Lot Number: 130418

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

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRWRM}, 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 : with standard uncertainty uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

u_{(s} = 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 a})

X_a = mean of Assay Method A with

ucher a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Page 1 of 4

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° 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 - 95.94 +6 6,7,8,9 [MoO4]-2(chemical form as received)

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

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

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

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

| Technique/Line | Estimated D.L. | Order | Interferences (underlined indicates severe) |
|--------------------|----------------------|-------|---|
| ICP-MS 95 amu | 3 ppt | n/a | 40Ar39K16O,79Br1 |
| | | | 6O,190Os2+,190Pt |
| | | | 2+ |
| ICP-OES 202.030 nm | 0.008 / 0.0002 µg/mL | 1 | Os, Hf |
| ICP-OES 203.844 nm | 0.012 / 0.002 μg/mL | 1 | |
| ICP-OES 204.598 nm | 0.012 / 0.001 µg/mL | 1 | Ir, Ta |

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

- 10.1 ISO 9001 Quality Management System Registration
 - QSR Certificate Number QSR-1034
- 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"
 - Chemical Testing Accredited / A2LA Certificate Number 883.01
- 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"
 - Reference Material Producer Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 17, 2022

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

11.2 Lot Expiration Date

- July 17, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong Supervisor, Product Documentation

Meyer Trusing

Certificate Approved By:

Michael Booth Director, Technical Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Saine

Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



ACCREDITATION / REGISTRATION

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

PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

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

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

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

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

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

Assay Information:

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

The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance $\frac{1}{1000}$

Certified Value, X_{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-OES and ICP-MS. The result from the most sensitive method for each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of ore each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of the 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 > sO 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 853000.0 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 0.004577 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 Coth series alongs mirror and the constant and the country of the Coth series alongs mirror and the country of the Coth series alongs mirror and the country of the Coth series alongs mirror and the country of the country

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.

| Oliver | | | Intormation (ICP-OEC h | Jidoseo manda J |
|---|---------|-----------|--|---------------------------|
| (weiv Isixs/Isib | as ra | are given | Estimation (ICP-OES D.L.s | Technique/Line |
| Terences (underline 4 : | Inter | Order | 14q Pt | ICP-MS 48 amu |
| ferences (underlined indicates severe) 60, 32514N, | 3281 | A/N | | |
| 60180, | | | | |
| 7N2, 36Ar12C, | INDL | | | |
| Z=X96] 1 | 4009 | | | |
| e X = Zr, Mo, | (wher | | | ICP-0FS 220 4F6 |
| | I(ns | | Jm/gu Se000.0 \ +600.0 | ICP-OES 334.941 nm |
| | Ce, Ai | | Im/pu 8S0000.0 \ 8E00.0 | ICE-OES 336.121 nm |
| ع. כ ר, ט | BI ,UVI | | | MIN 121,000 0=- |
| ره ره | oM, W | | Jm/gq 450000.0 \ cocord i bosots so basedard ad fon b | note: Inis standard shoul |
| | | | | |

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

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

- 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 if instructions in $Sec\ 7.1$ are not followed or if the CRWRM is damaged, confaminated, or otherwise modified.

Thomas Kozikowski Manager, Quality Control Certificate Approved By:

thibils Validity

- June 17, 2027 11.2 Lot Expiration Date

June 17, 2022 11.1 Certification Issue Date

Paul Gaines Certifying Officer:

0.Sr

0.11

CERTIFIED WEIGHT REPORT:

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



K S981 Reference Material CRM R S981







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

| | | 060724 | | | | 060724 | | | ached pg.) NIST | LD50 SRM | S S S S S S S S S S S S S S S S S S S | ı | | |
|--------------------------|---|-------------------|------------------|----------------------|--------------------------------|---------------------|---|-----------------|--|--|---------------------------------------|---|-----------------------|---|
| | Capeate | Giovanni Esposito | 2 | V | lord | Pedro L. Rentas | | SDS Information | (Solvent Safety Info. On Attached pg.) | OSHA PEL (TWA) | | ı | | |
| | Lievannie | | 1 | ! | N. P. | | | | (Solve | CAS# | 13520-83-7 | | | |
| | Lieva | Formulated By: | | | 13 | Reviewed By: | | Expanded | Uncertainty | +/- (ug/mL) | 2.5 | | | |
| | | Nitric Acid | | | | 1- | ij | | Final | Conc. (ug/mL) | 1000.0 | | | |
| Solvent: | Nitric Acid | 40.0 | (mf.) | | | | | | Initial | Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) | 10001.5 | | near] | |
| Lot # | 24002546 | 2.0% | | | | sinty | | | Nominal | Conc. (ug/mL) | 1000 | | 2.D# [Count] [Linear] | |
| 0 | | | | | | Balance Uncertainty | Flask Uncertainty | | Uncertainty | Pipette (mL) | 0.084 | | 92.D# [c | |
| KI U | | | | | | 5E-05 | 0.100 | | Initial | Vol. (mL) | 200.0 | | sec]:570 | |
| | = | 31 | | (၃ | | | 2000.07 | | Dilution | Factor | 0.1000 | | [23.254 sec]:5709 | |
| | 57092 060724 Uranium (11) | | 060727 | Ambient (20 °C) | 1000 | 6UTB | d to (mL): | | Lot | Number | 58192 041524 | | | |
| | | | * | - 24 | <u></u> | :- | was dilute | | Part | Number | 58192 | | trum Z | |
| CERTIFIED WEIGHT REPORT: | Part Number: Lot Number: Description: | | Expiration Date: | Recommended Storage: | Nominal Concentration (µg/mL): | NIST Test Number: | Volume shown below was diluted to (mL): | | | Compound | 1. Uranyl nitrate hexahydrate (U) | | [1] Spectrum No.1 | 0 |

| 1.0E6 | 5.0E5 | m/z-> 5.0E4 | 2.5E4 | m/z-> | S.OES | \.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ |
|---|-------|----------------|-------|---------|-------|--|
| [1] Spectrum No.1 | | 0 | | 011 | | C |
| | | O | | 120 | | 0 |
| [23.264 sec]:57092.D# [Count] [Linear] | | Og | | 130 | | .0 |
| 7092.D * [C | | 0 | | 140 | | |
| ount] [Line | | 80 | | 081 | | |
| 2. | | O e | | 160 | | |
| | | 2 | | 170 | | |
| | | 990 | | -@ - | | |
| | | Oe | | 081 | | |
| | | 100 | | 200 | | |

Lot # 060724





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

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

| | Se <0.2 |
|----------|--|
| (µg/mL) | Pr |
| -MS | |
| by ICP | 9 |
| ation | N S S R a K M |
| Verifica | 60.02 60.02 60.02 60.02 60.02 60.02 |
| etals | M M M M M M M M M M M M M M M M M M M |
| Trace M | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 |
| П | 35235 |
| | 8 |
| | \$ 8 8 8 8 6 |
| | 40.02 40.02 40.02 40.02 40.02 |
| | ឌីបីបីបីបីសី |
| | 40.02 40.02 40.02 40.02 40.02 40.02 |
| | B Ba |

(T) = Target analyte

Physical Characterization:

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





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).

* 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).

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 |
|-------------|-------------------------------|-----------------------------|---|--|---------------------------------|--|-------|
| ¥ | Z #107 | 7 | 2 | 2/11/0 | > | | |
| Solvent: | Solvent: 24002546 Nitric Acid | Nitric Acid | | A Company of the Comp | Ratio Andrews | | |
| 2% | 40.0 | Nitric Acid | | Formulated By: | Benson Chan | 031524 | |
| | (III) | | | M | Hento | | |
| Uncertainty | | | | Reviewed By: | Pedro L. Rentas | 031524 | |

| Part Number: Lot Number: | | i d | | Solvent: | Solvent: 24002546 Nitric Acid | Nitric Acid | | | | | |
|---|---|---------------|-------------------------|----------------------------------|-------------------------------|-------------|--------------------------------------|----------------|--|--------------------|--------|
| Description: | Strontium (Sr) | (Sr) | | % | 40.0 | Nitric Acid | | Formulated Bv: | Benson Chan | 80 | 031524 |
| Expiration Date: | 031527 | | | | | | | 1 | 1 | | |
| Recommended Storage: | Ambient (20 °C) | (2) | | | | | | 1 | The state of the s | 1 | |
| Nominal Concentration (µg/mL): | 1000 | | | | | | | Jan | a plene | , A | |
| NIST Test Number: | 6UTB | | 5E-05 Balar | 5E-05 Balance Uncertainty | | | | Reviewed By: | Pedro L. Rentas | | 031524 |
| Weight shown below was diluted to (mL); 2000.07 | s diluted to (mL): | 2000.07 | 0.100 Flask Uncertainty | Uncertainty | | | | | | | |
| | | | | | | | | Expanded | SDS Information | rmation | |
| | Lot | Nominal | Purity Unce | Nominal Purity Uncertainty Assay | Target | Actual | Actual | Uncertainty | (Solvent Safety Info. On Attached pg.) | . On Attached pg.) | TSIN |
| Compound | RM# Number Conc. (µg/mL) (%) Purity (%) (%) | Conc. (µg/mL) | (%) Puri | ty (%) (%) | Weight (g) | Weight (g) | Weight (g) Conc. (µg/mL) +/- (µg/mL) | | CAS# OSHA PEL (TWA) | WA) LD50 | SRM |

| 1. Strontium nitrate (Sr) | | IN017 SHZ022018A1 | 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] Spect | [1] Spectrum No.1 | [14.495 sec]:58138.D# [Count] [Linear] | sec]:581 | 38.D# | Coun | it] [Linea | | | | | | |
| 2.5E6 | | | | | | | | | | | | -90-000 Market Market | |
| m/z->> 1.0E6 | T | 10 20 | | O | 0 | | .00 | 09 | 0, | | 80 | . <u>0</u> | 100 |
| 5.0ES | | | | | | | | | | | | | |
| m/z-≫ 5.0E6 | The second of th | 110 120 | | 130 | 041 | | 150 | 160 | 0.71 | | 180 | 081 | 200 |
| 2.5E6 | | | | | | | | | | | | | |
| V-z/E | · 'n | 220 | | 230 | 240 | 14 | 250 | 260 | | | | | |





Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

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

(T) = Target analyte

Physical Characterization:

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



Certified by:

1. P

Lot # 031524

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

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

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

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

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

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Certified Reference Material CRM

| MS982 | R: 6/11/24







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

| | | | Comment Comment of the second | Nitric Acid Formulated By: Benson Chan 071423 | 7 | | flesh Mento | Reviewed By: Pedro L. Rentas 071423 | | Expanded SDS Information | Final Uncertainty (Solvent Safety Info. On Attached pg.) NIST | Vol. (ml.) Pipette (ml.) Conc. (µg/ml.) Conc. (µg/ml.) Conc. (µg/ml.) +/- (µg/ml.) CAS# OSHA PEL (TWA) LD50 SRM |
|--------------------------|--------------|-------------|-------------------------------|---|------------------|----------------------|--------------------------------|-------------------------------------|---|--------------------------|---|---|
| Solvent: | Nitric Acid | | | 40.0 | (mL) | | | | | | Initial | Conc. (µg/mL |
| Lot # | 21110221 | | | 2.0% | | | | ainty | £, | | Nominal | Conc. (µg/mL) |
| | | | | | | | | Balance Uncertainty | Flask Uncertainty | | Uncertainty | Pipette (mL) |
| | | | | | | | | SE-05 | 0.058 | | Initial | Vol. (mL) |
| | | | (Zr) | | | (),(| | | 2000.02 | | Dilution | Factor |
| | 57040 | 071423 | Zirconium (Zr) | | 071426 | Ambient (20 °C) | 1000 | 6UTB | id to (mL): | | Lot | Number |
| | | | | | | | | | was dilute | | Part | Number |
| CERTIFIED WEIGHT REPORT: | Part Number: | Lot Number: | Description: | | Expiration Date: | Recommended Storage: | Nominal Concentration (µg/mL): | NIST Test Number: | Volume shown below was diluted to (mL): | | | Compound |

| Zirconyl chloride | 1. Zirconyl chloride octahydrate (Zr) | 58140 | 58140 070621 | 0.1000 | 200.0 | 0.084 | 1000 | 10000.3 1000.0 | | 2.2 | 13520-92-8 | NA | NA | ¥ Z |
|-------------------|---------------------------------------|-------------------|--------------|---|---------|---------|----------|----------------|-----|-----|------------|-----|-----|-----|
| | [1] Spec | [1] Speatrum No.1 | | [41.153 sec]:57040.D# [Count] [Linear] | ec]:570 | 40.0# [| Count (L | inear | | | | | | |
| 16 | 5.0 E6 | | | | | | | | | | | | | |
| 7,4% 1.0E | /z-: | 0 | O N | 00 | | 0 | 00 | 0 | 0.7 | • | 0 | 0 | 00 | |
| ΰ | 6.0E7 | | | | | | | | | | | | | |
| ™.Z~3 | 0 | 011 | 0 20 0 | 08 | | 04 | 90 | 160 | 170 | 4~ | 081 | 160 | 000 | |
| ΰ | 5.0E7 | | | | | | | | | | | | | |
| K-2/LL | | 0 10 | 220 | 230 | | 240 | 250 | 280 | | | | | | |

Lot # 071423



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):

| | | | 9 1 | | _ | _ | _ | - | - | - | | | |
|---|-----------|--|--|-------|--------------|----------------|------------------|--------------|----------|---|--------------|--------------|--------------|
| | | | N. Commission | <0.05 | - | 40.02 | 200 | 70.00 | Ø.02 | 50 67 | 70.05 | \$0.05 \$ | € |
| | | | | W | : | > | > | - | g R | > | 1 | Zu | 7. |
| | | | The state of the s | <0.02 | 000 | Z0'0> | <0.02 | | Z0:02 | CD 02 | | 40.02 | 900 |
| | | | | £ | Ę | 2 | F | E | - - | Ē | | E S | ľ |
| | | | | 97 | 200 | 70.05 | & 9.02 | ç | 703 | 80.02 | 8 | 70'05 | 40.02 |
| | | ı | Ì | 2 | <i>57</i> | 5 | Ag | ź | 2 | ķ | 6 | 2 | Ē |
| | (m) | | 000 | Z0'0Z | <0.05 | 200 | \$0.02 \$0.02 | 200 | 70.05 | Q.02 | 200 | 70:02 | Q.02 |
| | /6/1) | | ŀ | L; | Re | | ž | Rh | 1 | 2 | Ę | | Sc |
| | y ICP-MS | CONTRACTOR OF THE PERSONS | 800 | 70.00 | 40.02 | 5 | 70.05 | 20.05 | | Q0:02 | 200 | 3010 | Q.2 |
| | ion b | | Ž | 75 | ź | ć | 5 | 2 | , | <u>.</u> | Ā | : : | 4 |
| | Verificat | | SUCH | *0.0* | €0.02 | 5 | 10.07 | <0.02 | ç | 705 | ₹0.02 | 2 | 70.02 |
| ı | stals | | E | i | 3 | Ma | TA S | Mn | ń | 70 | W | 22 | DAI |
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| | | SHOOTING SALLS | <0.02 | ç | 70.7 | <0.02 | 6 | Z0:02 | <0.02 | | ₹0.02 | Q 002 | |
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| | | THE PERSON | A | £. | 3 | As | D. | Pa | 8 | ë | 5 | m | |

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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







Printed: 6/7/2024, 3:58:47 PM

Lot # 071423

Part # 57040

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 (HNO ₃) | 69.0 - 70.0 % | 69.7 % |
| Appearance | Passes Test | Passes Test |
| Color (APHA) | ≤ 10 | 5 |
| Residue after Ignition | ≤ 2 ppm | 1 ppm |
| Chloride (Cl) | ≤ 0.08 ppm | < 0.03 ppm |
| Phosphate (PO 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 | 2.3 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 30.0 ppb | < 1.0 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Copper (Cu) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Gallium (Ga) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Germanium (Ge) | ≤ 20 ppb | < 10 ppb |
| Trace Impurities - Gold (Au) | ≤ 20 ppb | < 5 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | 100 ppb |
| Trace Impurities - Iron (Fe) | ≤ 40.0 ppb | < 1.0 ppb |
| Trace Impurities – Lead (Pb) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Lithium (Li) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb | < 1 ppb |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Nickel (Ni) | ≤ 20.0 ppb | < 5.0 ppb |

>>> Continued on page 2 >>>





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

| n Result | Result |
|------------|------------|
| < 1.0 ppb | < 1.0 ppb |
| 16 ppb | 16 ppb |
| < 10 ppb | < 10 ppb |
| < 1.0 ppb | < 1.0 ppb |
| < 5.0 ppb | < 5.0 ppb |
| < 1.0 ppb | < 1.0 ppb |
| < 5.0 ppb | < 5.0 ppb |
| < 5.0 ppb | < 5.0 ppb |
| < 10.0 ppb | < 10.0 ppb |
| < 1.0 ppb | < 1.0 ppb |
| < 1.0 ppb | < 1.0 ppb |
| < 1.0 ppb | < 1.0 ppb |
| < 1.0 ppb | < 1.0 ppb |
| 10 par/ml | |
| 3 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 |
| Frace 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 |
| race 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





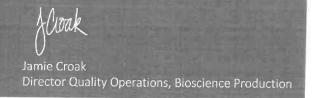
Material No.: 9530-33 Batch No.: 24D1562005

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



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 |
| Frace 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 |
| race 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





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:

IV-STOCK-12

Lot Number:

U2-MEB734294

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

10 µg/mL ea:

Barium, Bismuth, Cobalt, Lithium.

Lead,

Beryllium, Cerium, Indium,

Nickel. Uranium

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

| ANALYTE | CERTIFIED VALUE | ANALYTE | CERTIFIED VALUE |
|-------------|------------------------|---------------|------------------------|
| Barium, Ba | 10.01 ± 0.04 μg/mL | Beryllium, Be | 10.01 ± 0.05 μg/mL |
| Blsmuth, Bl | 10.01 ± 0.06 µg/mL | Cerium, Ce | 10.01 ± 0.04 μg/mL |
| Cobalt, Co | 10.01 ± 0.05 μg/mL | Indium, in | 10.01 ± 0.04 µg/mL |
| Lead, Pb | 10.00 ± 0.04 μg/mL | Lithium, Li | 10.01 ± 0.04 µg/mL |
| Nickel, Ni | 10.01 ± 0.04 µg/mL | Uranium, U | 10.01 ± 0.05 µg/mL |

Density: 1.025 g/mL (measured at 20 \pm 4 °C)

Assay Information:

| ANALYTE | METHOD | NIST SRM# | SRM LOT# |
|---------|-------------|-------------------|--------------|
| Ва | ICP Assay | 3104a | 140909 |
| Ва | Calculated | | See Sec. 4.2 |
| Ва | Gravimetric | | See Sec. 4.2 |
| Be | ICP Assay | 3105a | 090514 |
| Be | Calculated | | See Sec. 4.2 |
| Bi | ICP Assay | 3106 | 180815 |
| Ce | ICP Assay | 3110 | 160830 |
| Ce | EDTA | 928 | 928 |
| Ce | Calculated | | See Sec. 4.2 |
| Со | ICP Assay | 3113 | 190630 |
| Co | EDTA | 928 | 928 |
| Co | Calculated | | See Sec. 4.2 |
| In | ICP Assay | 3124a | 110516 |
| In | EDTA | 928 | 928 |
| In | Calculated | | See Sec. 4.2 |
| Li | ICP Assay | 3129a | 100714 |
| Li | Calculated | | See Sec. 4.2 |
| Li | Gravimetric | | See Sec. 4.2 |
| Ni | ICP Assay | 3136 | 120619 |
| Ni | EDTA | 928 | 928 |
| Ni | Calculated | | See Sec. 4.2 |
| Pb | ICP Assay | 3128 | 101026 |
| Pb | EDTA | 928 | 928 |
| Pb | Calculated | | See Sec. 4.2 |
| U | ICP Assay | traceable to 3164 | R2-U689597 |
| U | 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_{CRMRM}, 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}_{\parallel} = the weighting factors for each method calculated using the inverse square of the variance:

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, X_{CRWRM} , where one method of characterization is used is the mean of individual results:

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

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u_{char a} = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

| Isotope | Atom % |
|--------------|-------------|
| Uranium 238U | 99.8 ± 0.1 |
| Uranium 235U | 0.19 ± 0.05 |

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

- **6.1** This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.
- 6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale.</u>

 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

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

June 21, 2023

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

11.2 Lot Expiration Date

- June 21, 2028
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

| Sealed TCT Bag Open Date | o: |
|--|----|
| | |

- 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

Paul R. Simo

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

58111 122223

Sodium (Na)

Lot Number: Description:

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000

Weight shown below was diluted to (mL):

3000.4

0.06 Flask Uncertainty 5E-05 Balance Uncertainty

RW#

Number Lot

Nominal

Purity

Uncertainty Assay Purity (%)

Target

Actual

8

38

Recommended Storage:

Ambient (20 °C)

122226

Expiration Date:

Lot # M5807

Solvent:

24002546 Nitric Acid

2%

60.0 (III)

Nitric Acid

Formulated By: 13817 P Aleah O'Brady Back

Reviewed By: Pedro L. Rentas

122223

22223

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

CAS#

SE

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

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

Part # 58111



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

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

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Physical Characterization:

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

Certified by:

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

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

* All standard containers are meticulously cleaned prior to use.

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

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



Certificate of Analysis
M5738 M5739 M5740 M5741 M5742

Refine your results. Redefine your industry.

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:

6020ISS

Lot Number:

S2-MEB709511

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

10 µg/mL ea:

Bismuth,

Holmium,

Indium,

6-Lithium.

Rhodium,

Scandium,

Terbium,

Yttrium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE 6-Lithium, Li6 **CERTIFIED VALUE** $10.00 \pm 0.03 \,\mu g/mL$

ANALYTE

CERTIFIED VALUE $10.00 \pm 0.05 \,\mu g/mL$

Bismuth, Bi

Indium, In

10.00 ± 0.04 µg/mL

Holmium, Ho Rhodium, Rh

 $10.00 \pm 0.05 \,\mu g/mL$ 10.00 ± 0.07 µg/mL

Scandlum, Sc

10.00 ± 0.04 µg/mL

Terbium, Tb

10.00 ± 0.04 µg/mL

Yttrium, Y

 $10.00 \pm 0.04 \, \mu g/mL$

Density:

1.035 g/mL (measured at 20 \pm 4 °C)

Assay Information:

| ANALYTE | METHOD | NIST SRM# | SRM LOT# |
|---------|-------------|-----------|--------------|
| Bi | ICP Assay | 3106 | 180815 |
| Bi | Calculated | | See Sec. 4.2 |
| Но | ICP Assay | 3123a | 090408 |
| Но | EDTA | 928 | 928 |
| In | ICP Assay | 3124a | 110516 |
| In | EDTA | 928 | 928 |
| In | Calculated | | See Sec. 4.2 |
| Li6 | Gravimetric | | See Sec. 4.2 |
| Rh | ICP Assay | 3144 | 070619 |
| Sc | ICP Assay | 3148a | 100701 |
| Sc | EDTA | 928 | 928 |
| Tb | ICP Assay | 3157a | 100518 |
| Tb | EDTA | 928 | 928 |
| Tb | Calculated | | See Sec. 4,2 |
| Υ | ICP Assay | 3167a | 120314 |
| Υ | EDTA | 928 | 928 |
| Υ | 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 | Characterization of CRM/RM by One Method |
| Certified Value, X _{CRM/RM} , where two or more methods of characterization are used is the weighted mean of the results: | Certified Value, X _{CRWRM} , where one method of characterization is used is the mean of individual results: |
| $\begin{split} & \textbf{X}_{\text{CRM/RM}} = \Sigma\{w_i\} \{X_i\} \\ & \textbf{X}_i = \text{mean of Assay Method I with standard uncertainty } \textbf{u}_{\text{char I}} \\ & \textbf{w}_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & \textbf{w}_i = (1/u_{\text{char I}})^2 / (\Sigma(1/(u_{\text{char I}})^2)) \end{split}$ | X _{CRM/RM} = (X _a) (u _{cher a}) X _a = mean of Assay Method A with u _{cher a} = the standard uncertainty of characterization Method A |
| CRM/RM Expanded Uncertainty (\pm) = $U_{CRM/RM}$ = k ($u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ta}$) $^{1/2}$ k = coverage factor = 2 $u_{char} = (2((w_i)^2 (u_{char})^2)]^{1/2}$ where u_{char} i are the errors from each characterization method $u_{bb} = b$ obtile to bottle homogeneity standard uncertainty $u_{lts} = long$ term stability standard uncertainty (storage) $u_{tb} = t$ transport stability standard uncertainty | CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ $k = coverage\ factor = 2$ $U_{char\ a} = the\ errors\ from\ characterization$ $U_{bb} = bottle\ to\ bottle\ homogeneity\ standard\ uncertainty$ $U_{tts} = long\ term\ stability\ standard\ uncertainty\ (storage)$ $U_{ts} = transport\ stability\ standard\ uncertainty$ |

Certified Abundance:

IV's Certified Abundance

| <u>Isotope</u> | Atom % |
|----------------|---------------|
| Lithium Li6 | 95.6 ± 0.3 |
| Lithium Li7 | 4.4 ± 0.1 |

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 $20^{\circ} \pm 4^{\circ}$ 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; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 03, 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

- September 03, 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 CRWRM can be supported by long term 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.

11.3 Period of Validity

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Both

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

RD: 07/14/2022

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

Instructions for QATS Reference Material: ICP-MS ICS

QATS LABORATORY INORGANIC REFERENCE MATERIAL INTERFERENCE CHECK SAMPLE SET FOR ICP-MS (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 an 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-0803" and for the ICSAB mixture use "ICSA-0803+ICSB-0803".

<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 the Contracting Officer, Ross Miller at miller.ross@epa.gov. If directed by Ross Miller, 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

This interference check sample set is to be used to verify elemental isobaric correction factors of inductively coupled plasma-mass spectrometers (ICP-MS). This reference material set consists of two (2) concentrated solutions. The ICSA solution contains several interferent elements and species; for a complete listing refer to the CLP SOW. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for the ICP-MS ICS 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:





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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

ICSA-0803, Inferferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO₃. Analyze this solution by ICP-MS.

ICSB-0803, Analytes, mixed with ICSA-0803, 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 1% v/v HNO₃. Analyze this ICSAB solution by ICP-MS.

(D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-MS 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.

ICSA: M5873

| | Table 1. | | VALUES" FOI 303, AND ICSA | | | | MS |
|---------|----------|------------------|------------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element | CRQL | Part A (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) | Part A +Part B (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) |
| Al | 20.0 | [100000] | | | [100000] | | |
| Sb | 2.0 | (1.5) | -2.5 | 5.5 | (22.0) | 18.0 | 26.0 |
| As | 1.0 | (0.1) | -1.9 | 2.1 | 19.0 | 16.2 | 21.9 |
| Ba | 10.0 | (1.2) | -18.8 | 21.2 | (22.0) | 2.0 | 42.0 |
| Be | 1.0 | (0) | -2.0 | 2.0 | 19.0 | 16.2 | 21.9 |
| Cd | 1.0 | (0.7) | -1.3 | 2.7 | 20.0 | 17.0 | 23.0 |
| Ca | 500 | [100000] | | | [100000] | | |
| С | | [200000] | | | [200000] | | |
| CI | | [1000000] | | | [1000000] | | |
| Cr | 2.0 | (21.0) | 17.0 | 25.0 | 40.0 | 34.0 | 46.0 |
| Co | 1.0 | (1.0) | -1.0 | 3.0 | 20.0 | 17.0 | 23.0 |
| Cu | 2.0 | (8.0) | 4.0 | 12.0 | (25.0) | 21.0 | 29.0 |
| Fe | 200 | [100000] | | | [100000] | | |
| Pb | 1.0 | (4.0) | 2.0 | 6.0 | 25.0 | 21.3 | 28.8 |
| Mg | 500 | [100000] | | | [100000] | | |
| Mn | 1.0 | (7.0) | 5.0 | 9.0 | 27.0 | 23.0 | 31.1 |
| Мо | | [2000] | | | [2000] | | |
| Ni | 1.0 | (6.0) | 4.0 | 8.0 | 24.0 | 20.4 | 27.6 |
| Р | | [100000] | | | [100000] | | |
| K | 500 | [100000] | | | [100000] | | |
| Se | 5.0 | (0.3) | -9.7 | 10.3 | (19.0) | 9.0 | 29.0 |
| Ag | 1.0 | (0) | -2.0 | 2.0 | 18.0 | 15.3 | 20.7 |
| Na | 500 | [100000] | | | [100000] | | |
| S | | [100000] | | | [100000] | | |
| TI | 1.0 | (0) | -2.0 | 2.0 | 21.0 | 17.9 | 24.2 |
| Ti | | [2000] | | | [2000] | | |
| V | 5.0 | (0.5) | -9.5 | 10.5 | (19.0) | 9.0 | 29.0 |
| Zn | 5.0 | (11.0) | 1.0 | 21.0 | (29.0) | 19.0 | 39.0 |

[] Indicates analytes that do not require ICP-MS determination in the ICS.

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value \pm 2 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.

RD: 07/14/2022

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

Instructions for QATS Reference Material: ICP-MS ICS

QATS LABORATORY INORGANIC REFERENCE MATERIAL INTERFERENCE CHECK SAMPLE SET FOR ICP-MS (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 an 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-0803" and for the ICSAB mixture use "ICSA-0803+ICSB-0803".

<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 the Contracting Officer, Ross Miller at miller.ross@epa.gov. If directed by Ross Miller, 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

This interference check sample set is to be used to verify elemental isobaric correction factors of inductively coupled plasma-mass spectrometers (ICP-MS). This reference material set consists of two (2) concentrated solutions. The ICSA solution contains several interferent elements and species; for a complete listing refer to the CLP SOW. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Tl, Se, V, and Zn. This instruction sheet provides the nominal values for the ICP-MS ICS 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:





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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

ICSA-0803, Inferferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO₃. Analyze this solution by ICP-MS.

ICSB-0803, Analytes, mixed with ICSA-0803, 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 1% v/v HNO₃. Analyze this ICSAB solution by ICP-MS.

(D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-MS 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.

ICSA: M5873

| | Table 1. | | VALUES" FOI 303, AND ICSA | | | | MS |
|---------|----------|------------------|------------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element | CRQL | Part A (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) | Part A +Part B (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) |
| Al | 20.0 | [100000] | | | [100000] | | |
| Sb | 2.0 | (1.5) | -2.5 | 5.5 | (22.0) | 18.0 | 26.0 |
| As | 1.0 | (0.1) | -1.9 | 2.1 | 19.0 | 16.2 | 21.9 |
| Ba | 10.0 | (1.2) | -18.8 | 21.2 | (22.0) | 2.0 | 42.0 |
| Be | 1.0 | (0) | -2.0 | 2.0 | 19.0 | 16.2 | 21.9 |
| Cd | 1.0 | (0.7) | -1.3 | 2.7 | 20.0 | 17.0 | 23.0 |
| Ca | 500 | [100000] | | | [100000] | | |
| С | | [200000] | | | [200000] | | |
| CI | | [1000000] | | | [1000000] | | |
| Cr | 2.0 | (21.0) | 17.0 | 25.0 | 40.0 | 34.0 | 46.0 |
| Co | 1.0 | (1.0) | -1.0 | 3.0 | 20.0 | 17.0 | 23.0 |
| Cu | 2.0 | (8.0) | 4.0 | 12.0 | (25.0) | 21.0 | 29.0 |
| Fe | 200 | [100000] | | | [100000] | | |
| Pb | 1.0 | (4.0) | 2.0 | 6.0 | 25.0 | 21.3 | 28.8 |
| Mg | 500 | [100000] | | | [100000] | | |
| Mn | 1.0 | (7.0) | 5.0 | 9.0 | 27.0 | 23.0 | 31.1 |
| Мо | | [2000] | | | [2000] | | |
| Ni | 1.0 | (6.0) | 4.0 | 8.0 | 24.0 | 20.4 | 27.6 |
| Р | | [100000] | | | [100000] | | |
| K | 500 | [100000] | | | [100000] | | |
| Se | 5.0 | (0.3) | -9.7 | 10.3 | (19.0) | 9.0 | 29.0 |
| Ag | 1.0 | (0) | -2.0 | 2.0 | 18.0 | 15.3 | 20.7 |
| Na | 500 | [100000] | | | [100000] | | |
| S | | [100000] | | | [100000] | | |
| TI | 1.0 | (0) | -2.0 | 2.0 | 21.0 | 17.9 | 24.2 |
| Ti | | [2000] | | | [2000] | | |
| V | 5.0 | (0.5) | -9.5 | 10.5 | (19.0) | 9.0 | 29.0 |
| Zn | 5.0 | (11.0) | 1.0 | 21.0 | (29.0) | 19.0 | 39.0 |

[] Indicates analytes that do not require ICP-MS determination in the ICS.

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value \pm 2 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.

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Certified Reference Material CRM

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

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

1. Antimony (Sb)

58151

100923

0.1000

300.0

1000

10001.4

1000.0

7440-36-0

0.5 mg/m3

orl-rat 7000 mg/kg 3102a

Number Part

Number Ď

Vol. (ml.)

Pipette (ml.) Conc. (µg/ml.)

Conc. (µg/mL)

Conc. (µg/ml.)

+/- (µg/mt.) Uncertainty Expanded

CAS#

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

LD50

SRM NIST SDS Information

Final

Dilution Factor

Initial

Uncertainty

Nominal

Compound

| -2/m | 1.057 | m/z-> 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 0 | | | | | | |
| 0 | | 180 | | 9 | | |
| | | 170 | | 70 | | |
| | | 180 | | 8 | | |
| | | 190 | | 8 | | |
| | | | | Constitution or section of the control of the contr | | |
| | | 200 | | 100 | | |

Part # 57051



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

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

| | - | Г | - | | | | | _ | | | | | II | ľ | - | |
|---------------------|-------|--------------|----------------|-------|--------------|---------------|--------|-------------|--------------|------------|-------|-------------------------|--------------|-----------|------|---|
| | | 9 | 9 | _ | 8 | | 200 | 8 | <u></u> | 9 | - | 2 | ı | I | | |
| | | 70.0> | 2 1 | 28 | 10.05 | | 200 | 6 | 3 | - | | 8 | | | | |
| | | 2 | 2 8 | 3 | ζ. | 9 | ر ا | ξ | 2 | ದಿ | | 2 | | l | | |
| | | 20.02 | 600 | 3 | <u>8</u> | 400 | 3 | 70.02 | 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 | 3 | A.03 | - | 200 | 2000 | 400 | | FI GCG IA | 7300 | |
| | | Z | Mo | | T. | MD | | Z | l s | = | _ | | | SECON | +2 | I |
| (T) = Tamet analyte | | 40.00 | 20.02 | | <u>A</u> | 40.02 | | <u>0</u> 01 | 4000 | 3 | 20.02 | 200 | | ACHILLA | | |
| | Ŀ | ~ | 7 | | Ð | Pd | ! | ဂ္ဂ | M | Z | 2 | | | COL |) | |
| akao | 20.6 | 3 | 40,02 | 40.00 | 3 | A0.02 | | 2002 | 20.00 | 3 | 20.02 | | | DY ICE-N | | |
| | Ę | ç | Si | M | B | 25 | | 굣 | 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 | 7 | 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 | 80.02 | 20.04 | 2000 | | | | | |

(1) = Target analyte

Physical Characterization:

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

Certified by:

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

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

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

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

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Part # 57051

Lot # 120523

Certified Reference Material CRM

M6030



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

R = 8 | 5 | 24

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CERTIFIED WEIGHT REPORT:

800-368-1131

Absolute Standards, Inc.

Part Number: Solvent: 24002546 Lot # Nitric Acid

Lot Number: Description: 57047 122823 Silver (Ag)

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

Weight shown below was diluted to (mL): 4000.30

1. Silver nitrate (Ag)

IN035 J0612AGA1

1000.0

0.10

63.7

6.27992

6.27998

1000.0

2.0

7761-88-B

10 ug/m3

Z

3151

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

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

Formulated By:

Benson Chan

122823

122823

Reviewed By: Pedro L. Rentas

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

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

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| | | | | | | | race Me | letals | Verificat | tion | by ICP-I | S | 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 0.02 | 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.
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- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.
 * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Certified Reference Material CRM

MS473 MS474 MS475

Nitric Acid

Solvent: 20510011

Lot #



Absolute Standards, Inc.

www.absolutestandards.com

Strontium (Sr) 082922 56138

> Lot Number: Description:

Part Number:

CERTIFIED WEIGHT REPORT:

Ambient (20 °C) 082925

Expiration Date:

10000 Recommended Storage: Nominal Concentration (µg/mL):

6UTB NIST Test Number:

Suran

Pedro L. Rentas Reviewed By:

082922

082922

Lawrence Barry

Formulated By:

Nitric Acid

20.0 (mL)

%

5E-05 Balance Uncertainty 0.058 Flask Uncertainty 1000.12 Weight shown below was diluted to (mL):

Expanded Uncertainty Actual

CAS# +/- (µg/mL) Weight (g) Conc. (ug/mL)

OSHA PEL (TWA)

NIST SRM

SDS Information (Solvent Safety Info. On Attached pg.)

ž 10042-76-9 20.0

orl-rat >2000mg/kg 3153a LD50

100001 24.2758 [14.495 sec]:58138.D# [Count] [Linear] 24.2756 41.2 0.10 99.997 10000 IN017 SRZ022018A1 [1] Spectrum No.1

Weight (g)

8

Purity (%)

8

Conc. (µg/mL)

Number

RM#

5.0E6

Strontium nitrate (Sr)

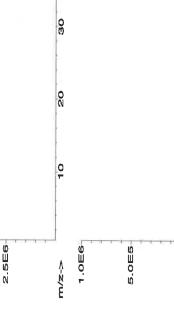
Compound

Nominal

Ę

Target

Purity Uncertainty Assay



100

06

80

0

80

50

04

200

190

180

170

160

150

140

130 120 110

W/z->

5.0E6 2.5E6

210 ~-z/w 1 of 2

260

250

240

230

Printed: 9/21/2022, 11:20:01 PM

Lot # 082922

www.absolutestandards.com





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

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

| Al <a. colspan="8"> Cd <a. colspan="8"> Al <a. colspan="8"><a. <="" colspan="8" th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>Trace Me</th><th>detals</th><th>Verification</th><th>tion</th><th>by ICP-N</th><th>MS (</th><th>(Jm/b/)</th><th></th><th></th><th></th><th></th><th></th><th></th></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.> | | | | | | | | Trace Me | detals | Verification | tion | by ICP-N | MS (| (Jm/b/) | | | | | | |
|--|----|-------|----|-------|----|------------|----|----------|---------------|--------------|------|----------|------|---------|----|---------------|----|-------|----|--------------------|
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| <0.02 | ΑI | <0.02 | ප | <0.02 | Š | <0.02 | 田 | <0.02 | Ξ | <0.02 | ž | <0.02 | ŀ. | <0.02 | Se | <0.2 | TP | <0.02 | ≱ | <0.02 |
| <0.2 | SP | <0.02 | రా | <0.2 | 丏 | <0.02 | He | <0.02 | Ľ | <0.02 | ĝ | <0.02 | Re | <0.02 | Si | <0.02 | Te | <0.0> | Ω | <0.02 |
| <0.02 | As | <0.2 | రొ | <0.02 | 뤕 | <0.02 | 딥 | <0.02 | Mg | <0.01 | ő | <0.02 | R. | <0.02 | Ag | <0.02 | E | <0.02 | > | <0.02 |
| <0.01 | Ba | <0.02 | చ | <0.02 | 3 | <0.02 | 1 | <0.02 | Ā | <0.02 | 몺 | <0.02 | Rb | <0.02 | Na | <0.2 | Ę | <0.02 | Yb | <0.02 |
| <0.02 | Be | <0.01 | ರ | <0.02 | පී | <0.02 | 먑 | <0.2 | Hg | <0.2 | Ь | <0.02 | Ru | <0.02 | Sr | Τ | Tm | <0.02 | ¥ | <0.02 |
| <0.02 | Bi | <0.02 | ථ | <0.02 | පී | <0.02 | La | <0.02 | Mo | <0.02 | 五 | <0.02 | Sm | <0.02 | S | <0.02 | Sn | <0.02 | Zp | <0.02 |
| | В | <0.02 | ı | <0.02 | Αn | <0.02 | Pb | <0.02 | PN | <0.02 | × | <0.2 | Š | <0.02 | Ta | <0.02 | Ë | <0.02 | Zr | <0.02 |

(T)= Target analyte

Physical Characterization:

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



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Certified Reference Material CRM

MS473 MS474 MS475

Nitric Acid

Solvent: 20510011

Lot #



Absolute Standards, Inc.

www.absolutestandards.com

Strontium (Sr) 082922 56138

> Lot Number: Description:

Part Number:

CERTIFIED WEIGHT REPORT:

Ambient (20 °C) 082925

Expiration Date:

10000 Recommended Storage: Nominal Concentration (µg/mL):

6UTB NIST Test Number:

Suran

Pedro L. Rentas Reviewed By:

082922

082922

Lawrence Barry

Formulated By:

Nitric Acid

20.0 (mL)

%

5E-05 Balance Uncertainty 0.058 Flask Uncertainty 1000.12 Weight shown below was diluted to (mL):

Expanded Uncertainty Actual

CAS# +/- (µg/mL) Weight (g) Conc. (ug/mL)

OSHA PEL (TWA)

NIST SRM

SDS Information (Solvent Safety Info. On Attached pg.)

ž 10042-76-9 20.0

orl-rat >2000mg/kg 3153a LD50

100001 24.2758 [14.495 sec]:58138.D# [Count] [Linear] 24.2756 41.2 0.10 99.997 10000 IN017 SRZ022018A1 [1] Spectrum No.1

Weight (g)

8

Purity (%)

8

Conc. (µg/mL)

Number

RM#

5.0E6

Strontium nitrate (Sr)

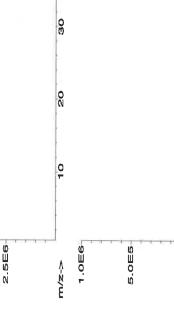
Compound

Nominal

Ę

Target

Purity Uncertainty Assay



100

06

80

0

80

50

04

200

190

180

170

160

150

140

130 120 110

W/z->

5.0E6 2.5E6

210 ~-z/w 1 of 2

260

250

240

230

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Lot # 082922

www.absolutestandards.com





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

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

| Al <a. colspan="8"> Cd <a. colspan="8"> Al <a. colspan="8"><a. <="" colspan="8" th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>Trace Me</th><th>detals</th><th>Verification</th><th>tion</th><th>by ICP-N</th><th>MS (</th><th>(Jm/b/)</th><th></th><th></th><th></th><th></th><th></th><th></th></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.></a.> | | | | | | | | Trace Me | detals | Verification | tion | by ICP-N | MS (| (Jm/b/) | | | | | | |
|--|----|-------|----|-------|----|------------|----|----------|---------------|--------------|------|----------|------|---------|----|---------------|----------------|-------|----|--------------------|
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| <0.02 | ΑI | <0.02 | ප | <0.02 | Š | <0.02 | 田 | <0.02 | Ξ | <0.02 | ž | <0.02 | ŀ. | <0.02 | Se | <0.2 | TP | <0.02 | ≱ | <0.02 |
| <0.2 | SP | <0.02 | రా | <0.2 | 丏 | <0.02 | He | <0.02 | Ľ | <0.02 | ĝ | <0.02 | Re | <0.02 | Si | <0.02 | T _e | <0.0> | Ω | <0.02 |
| <0.02 | As | <0.2 | రొ | <0.02 | 뤕 | <0.02 | 딥 | <0.02 | Mg | <0.01 | ő | <0.02 | R. | <0.02 | Ag | <0.02 | E | <0.02 | > | <0.02 |
| <0.01 | Ba | <0.02 | చ | <0.02 | 3 | <0.02 | 1 | <0.02 | Ā | <0.02 | 몺 | <0.02 | Rb | <0.02 | Na | <0.2 | Ę | <0.02 | Yb | <0.02 |
| <0.02 | Be | <0.01 | ರ | <0.02 | පී | <0.02 | 먑 | <0.2 | Hg | <0.2 | Ь | <0.02 | Ru | <0.02 | Sr | Τ | Tm | <0.02 | ¥ | <0.02 |
| <0.02 | Bi | <0.02 | ථ | <0.02 | පී | <0.02 | La | <0.02 | Mo | <0.02 | 五 | <0.02 | Sm | <0.02 | S | <0.02 | Sn | <0.02 | Zp | <0.02 |
| | В | <0.02 | ı | <0.02 | Αn | <0.02 | Pb | <0.02 | PN | <0.02 | × | <0.2 | Š | <0.02 | Ta | <0.02 | Ë | <0.02 | Zr | <0.02 |

(T)= Target analyte

Physical Characterization:

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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 | | | ၀ (၄) | | | | | | |
| Purity Uncertainty Assay | | 0.10 Flask Uncertainty | 5E-05 Balance Uncertainty | | | | 2% | | | Solvent: | |
| Target | | | | | | (mL) | 40.0 | | | Solvent: 24002546 | Lot # |
| Actual | | | | | | | Nitric Acid | | | Nitric Acid | |
| Actual | | | | | | | | | | | |
| Uncertainty | Expanded | | Reviewed By: | Juna | 1 | | Formulated By: | 4 | TO SE | > | |
| (Solvent Safety Info. On Attached pg.) | SDS Information | | Pedro L. Rentas | " human | A A | | Aleah O'Brady | 0 | San O To asign | 7 | |
| ched pg.) NIST | | | 062724 | | | | 062724 | | | , | |
| 7 | | | | | | | | | | | |

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

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

CAS#

OSHA PEL (TWA)

LD50

SRM

| -z/m | 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. | | in order | |
| | | | | | | | 000000000000000000000000000000000000000 | |
| 0 | | | 160 | | 60 | | | |
| | | | 4 | | 70 | | | |
| | | | 170 | | 0 | | | |
| | | | 180 | | 80 | | | 100 |
| | | | | | | | | |
| | | | 190 | | 90 | | | or any |
| | | | 200 | | 100 | | | |
| | | | ŏ | | ŏ | | | See all see al |
| | | | | | | | | 0 |

Part # 57081



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

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

| | | Œ | DI | ; <u>;</u> | R. | Da | į | As | 30 | 2 | 2 | | Ì | | |
|----------------------|-------|---------------|---------------|------------|-------|---------------|------------|-------|----------------|---------------|---|---|------------|-----------------|---|
| | | ∆ 0.02 | 20.02 | 3 8 | A) 01 | 20.02 | e de | 3 | 70.02 | 3 | 40.02 | | | | |
| | ŀ | 5 | S | , (| ? | CS | , (| 3 | 2 | > | 5 | | | | |
| | | 40.00 | 40.02 | 20.02 | 3 | <0.02 | 20.02 | 3 | 202 | > | 40.02 | | | | |
| | | A II | දි | Ç, | ? | ପୁ | į | 7 | 묙 | , | Dγ | | l | | |
| | 20,02 | 3 | ♦ 0.02 | 20.02 | 3 | ♦ 0.02 | 20.02 | 3 | 40,02 | | A0.02 | Towns of the last | | | |
| | 100 | 5 | L | 2 | 1 | Ħ | Б | 1 | Но | 1 | H | | I. | | |
| | 70.02 | 3 | ∆ .02 | 7.05 | 5 | ∆ .02 | 20.02 | 3 | <u>8</u> .02 | | 40.02 | | | Z D Z | |
| | | ź. | Mo | 911 | | š | ₩ <u></u> | : | L _a | ı | 1.4 | Service III | | 200 | |
| (T) = Target analyte | 20.02 | 3 | A (2) | 40.2 | , | A 0.02 | AJ.01 | 2 | ∆ .02 | 40.04 | 2003 | 450 E 3 00 W | 4 61 11160 | Varifics | |
| et anal | F | 4 ; | P | 70 | · ¦ | 전 | င္တ | 1 | Z | 142 | Z | | | ₹. 2 | |
| yte | 2.05 | 0.01 | 3 | <0.02 | 1000 | 40 02 | <0.02 | | 40.02 | 20.00 | 3 | | Dy ICI | 707 | |
| | Sc | E | 3 | R | , | 子 | 공 | | 元 연 | 2 | 2 | | | このこ | |
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| | Ta | ū | n | Sr | TAG | Z . | Ag | Į. | Ç. | č | | | | | |
| | 40,02 | 20.02 | 3 | ∆.02 | 7.07 | 3 | & 20.02 | 20.00 | 3 | 46 | | | | | |
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| | 40.02 | 20.02 | 3 | 40.02 | 70.02 | 2 | H | 70.02 | 3 | ∆ 0.02 | | | | | |
| | Zr | 120 | 1 | × | ID | Ś | < | C | 1, | \$ | | | | | |
| | 40.02 | 40.02 | | A).02 | 20,02 | | A) (2) | 20.02 | 3 | <u>&</u> | THE RESIDENCE AND PARTY OF THE | | | | |

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

| 7/2-7 | P. 58 E. 6 | m/z->- 5,0E8 | 1.0E7 | m/z-> 2.0E7 | 1.0厘6 | 2.0E6 |
|-------------|------------|-----------------|-------|----------------|-------|-------|
| | | | | | | |
| 210 | | 110 | | 0 | | |
| 220 | | 1 20 | | N. | | |
| Ö | | Ö | | 0 | | |
| N G O | | 130 | | 30 | | |
| N: | | | | A | | |
| N 4 | | 140 | | 0 | | |
| N 50 | | 50 | | 50 | | |
| b: | | | | | | ı |
| 260 | | 160 | | 60 | | |
| | | 170 | | 70 | | |
| | | | | | | |
| | | d . | | 80 | | |
| | | 190 | | 90 | | |
| | | | | | | |
| | | 200 | | 100 | | |

Part # 57023

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

| | E | В | Ве | Ba | AS | 00 | 2 2 | Δ | | |
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| | 40,02 | A),02 | 40.01 | 40.02 | 40.2 | 20.02 | 200 | A | | |
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| | 40.02 | 40,02 | <0.02 | 40.02 | 40.02 | 40.2 | 20.02 | 3 | | |
| | Au | ဂ္ဂ | స్ట | හු | Ē | 乓 | ي ر | | | |
| | 40.02 | 40.02 | 40,02 | 40.02 | 40.02 | <0.02 | 20.02 | | | |
| | 3 | <u>.</u> | 737 | 5 | 급 | Но | H | 1 | | |
| | 40.02 | 40.02 | 40,2 | 0.02 | ₫.02 | 40.02 | 40.02 | | Irace M | |
| | 곱 | 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 | ~ | ¥ | P | 2 | ဝွ | 7 | Z | S. St. St. | tion | |
| 6 | A0,2 | A 20.02 | A).02 | A).02 | ₫.02 | <0.02 | 0.02 | DESIGNATIONS OF | oy ICP-N | |
| | Sc | Sm | 7 | 공 | 2 | Re | 7 | | SI) SI | |
| | 40.02 | A (| A | 40.02 | A.02 | <0.02 | <0.02 | | /mL) | |
| | ng (| so s | ? | Z, | Ag | Si | æ | | | l |
| | 40.02 | A 6 | 3 6 | 40.2 | A).02 | 8.02 | <0.2 | | | |
| | # 1 | 8 | 1 | 3 | = | F. | 4T | | | |
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| | 27 | 7, | < 5 | \$. | < | a | ¥ | SPECIAL SECTION OF SEC | | |
| | 6.65 6.65 6.65 6.65 6.65 6.65 6.65 6.65 | 2 5 | 3 6 | § . | -3 | A 0.02 | <0.02 | THE REAL PROPERTY. | | |

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).