

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

8900, Fax: 908 789 8922

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

Order ID: P5165

Test: Metals CLP4 MS

Prepbatch ID: PB165564,

Sequence ID/Qc Batch ID: LB133950,

### Standard ID:

MP82128, MP83014, MP83016, MP83032, MP83033, MP83034, MP83035, MP83036, MP83037, MP83038, MP83039, MP83044, MP83042, MP83043, MP83044, MP83046, MP83047, MP83048, MP83049, MP83050, MP830498, MP83049, MP83049,

### Chemical ID:

M5192,M5288,M5289,M5294,M5304,M5390,M5476,M5498,M5513,M5515,M5519,M5658,M5698,M5739,M5751,M5769,M5798,M5799,M5800,M5801,M5802,M5806,M5815,M5816,M5817,M5818,M5819,M5820,M5873,M5874,M5961,M5962,M5976,M5978,M5981,M5982,M5983,M5993,M5999,M6021,M6023,M6025,M6028,M6030,M6033,M6040,M6055,M6095,M6115,M6126,W3112,





### Metals STANDARD PREPARATION LOG

| Recipe<br>ID | <u>NAME</u> | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------|---------|------------|--------------------|----------------|----------------|------------------|-------------------------------|
| 641          | 1:4 HCL     | MP82128 | 09/03/2024 | 02/08/2025         | Janvi Patel    | None           | None             | ,                             |
|              |             |         |            |                    |                |                |                  | 09/03/2024                    |

FROM 1500.00000ml of W3112 + 500.00000ml of M6040 = Final Quantity: 2000.000 ml

| Recipe<br>ID | NAME                             | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By  | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By  Mohan Bera |
|--------------|----------------------------------|------------|------------|--------------------|-----------------|----------------|------------------|---------------------------|
| 1122         | ICPMS CALIB<br>BLANK(S0/ICB/CCB) | MP83014    | 11/02/2024 | 12/14/2024         | Sarabjit Jaswal | None           | None             | 11/04/2024                |

FROM 25.00000ml of M6095 + 4925.00000ml of W3112 + 50.00000ml of M6115 = Final Quantity: 5000.000 ml



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### Metals STANDARD PREPARATION LOG

| Recipe<br>ID | NAME     | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By  | <u>ScaleID</u> | <u>PipettelD</u>         | Supervised By  Mohan Bera |
|--------------|----------|------------|------------|--------------------|-----------------|----------------|--------------------------|---------------------------|
| 2902         | S8 ICPMS | MP83016    | 11/02/2024 | 12/14/2024         | Sarabjit Jaswal | None           | METALS_PIP<br>ETTE_3 (A) |                           |

**FROM** 

 $1.00000 ml \ of \ M6033 + 2.50000 ml \ of \ M5288 + 2.50000 ml \ of \ M5515 + 5.00000 ml \ of \ M5498 + 5.00000 ml \ of \ M5806 + 79.00000 ml \ of \ MP83014 \ = Final \ Quantity: 100.000 \ ml$ 

| 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    |
| 3947      | S7(SFAM,6020,200.8) | MP83032    | 11/02/2024 | 12/14/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                     |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

**FROM** 

0.40000 ml of M5513 + 1.00000 ml of M5799 + 1.00000 ml of M5818 + 1.00000 ml of M5981 + 1.00000 ml of M5983 + 1.90000 ml of M6033 + 10.00000 ml of M6115 + 2.00000 ml of M5815 + 2.00000 ml of M5817 + 2.50000 ml of M5476 + 4.00000 ml of M5390 + 4.90000 ml of M5515 + 4.90000 ml of M5519 + 5.00000 ml of M6095 + 50.00000 ml of M5304 + 832.80000 ml of M5498 + 9.00000 ml of M5519 + 9.00000 ml of M5576 + 9.00000 ml of M5578 + 9.90000 ml of M5751 + 9.90000 ml of M5769 + 9.90000 ml of M5806 = Final Quantity: 1000.000 ml



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### Metals STANDARD PREPARATION LOG

| Recipe    |                     |            |            | <b>Expiration</b> | <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) | MP83033    | 11/02/2024 | 12/14/2024        | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                     |            |            |                   |                 |                | ETTE_3 (A)       | 11/04/2024    |

| 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    |
| 3954      | S4(SFAM,6020,200.8) | MP83034 | 11/02/2024 | 12/14/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                     |         |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 86.00000ml of W3112 + 12.50000ml of MP83032 = Final Quantity: 100.000 ml



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| Recipe    |                     |            |            | <b>Expiration</b> | <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    |
| 3949      | S5(SFAM,6020,200.8) | MP83035    | 11/02/2024 | 12/14/2024        | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                     |            |            |                   |                 |                | ETTE_3 (A)       | 11/04/2024    |

| FROM | 0.50000ml of M6095 + 1.00000ml of M6115 | + 73.50000ml of W3112 + 25.00000ml of MP83032 | = 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    |
| 3951      | S3(SFAM, 6020,200.8) | MP83036    | 11/02/2024 | 12/14/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                      |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 48.50000ml of W3112 + 10.00000ml of MP83033 = Final Quantity: 100.000 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    |
| 3955      | S2CONC(SFAM,6020,200.8) | MP83037    | 11/02/2024 | 12/14/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                         |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

**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 M6028 + 0.05000 ml of M6030 + 0.10000 ml of M5658 + 0.10000 ml of M5751 + 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 M5818 + 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 M6015 = Final Quantity: 250.000 ml

| 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    |
| 3956      | S2(SFAM,6020,200.8) | MP83038    | 11/02/2024 | 12/14/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                     |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 88.50000ml of W3112 + 0.50000ml of MP83037 = Final Quantity: 100.000 ml





### **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    |
| 3957      | S1(SFAM,6020,200.8) | MP83039    | 11/02/2024 | 12/14/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                     |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 88.50000ml of W3112 + 10.00000ml of MP83038 = 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)   | MP83041    | 11/02/2024 | 12/13/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |             |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

**FROM** 2.00000ml of M5294 + 98.00000ml of MP83014 = Final Quantity: 1000.000 ml



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### Metals STANDARD PREPARATION LOG

| Recipe            |             |                |                         | Expiration                | <u>Prepared</u>                         |                        |                       | Supervised By |
|-------------------|-------------|----------------|-------------------------|---------------------------|---|------------------------|-----------------------|---------------|
| <u>ID</u><br>3961 | NAME<br>CCV | NO.<br>MP83042 | Prep Date<br>11/02/2024 | <u>Date</u><br>12/14/2024 | <u>By</u><br>Sarabiit Jaswal            | <u>ScaleID</u><br>None | PipetteID  METALS PIP | Mohan Bera    |
|                   |             |                |                         |                           | , |                        | ETTE_3 (A)            | 11/04/2024    |

**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 M5476 + 10.00000 ml of M6115 + 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 M5598 + 4.50000 ml of M5598 + 4.50000 ml of M5976 + 4.50000 ml of M5978 + 5.00000 ml of M6095 + 823.45000 ml of W3112 = Final Quantity: 1000.000 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    |
| 1142      | ICSA ICPMS | MP83043    | 11/02/2024 | 12/13/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |            |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

FROM 10.00000ml of M5873 + 90.00000ml of MP83014 = Final Quantity: 100.000 ml



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### Metals STANDARD PREPARATION LOG

| Recipe<br>ID | NAME        | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By  | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By  Mohan Bera |
|--------------|-------------|------------|------------|--------------------|-----------------|----------------|--------------------------|---------------------------|
| 1143         | ICSAB ICPMS | MP83044    | 11/02/2024 | 12/14/2024         | Sarabjit Jaswal | None           | METALS_PIP<br>ETTE_3 (A) |                           |

FROM 10.00000ml of M5873 + 10.00000ml of M5874 + 80.00000ml of MP83014 = Final Quantity: 100.000 ml

| Recipe<br>ID | NAME            | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By  | ScaleID | PipetteID                | Supervised By |
|--------------|-----------------|---------|------------|--------------------|-----------------|---------|--------------------------|---------------|
| 3964         | CONC.LCSS SPIKE | MP83046 | 11/02/2024 |                    | Sarabjit Jaswal | None    | METALS_PIP<br>ETTE_3 (A) |               |

### **FROM**

0.25000 ml of M5698 + 0.25000 ml of M5798 + 0.25000 ml of M5800 + 0.25000 ml of M5801 + 0.25000 ml of M5961 + 0.25000 ml of M5982 + 0.25000 ml of M5983 + 0.25000 ml of M6023 + 0.25000 ml of M6025 + 0.25000 ml of M6026 + 0.25000 ml of M5600 + 0.50000 ml of M5289 + 0.50000 ml of M5658 + 0.50000 ml of M5751 + 0.50000 ml of M5802 + 1.25000 ml of M5802 + 1.25000 ml of M5799 + 1.250000 ml of M5819 + 1.25000 ml of M5962 + 1.250000 ml of M6021 + 12.50000 ml of M5806 + 12.52000 ml of M5519 + 156.23000 ml of W3112 + 2.50000 ml of M5390 + 2.50000 ml of M5818 + 5.00000 ml of M5515 + 5.00000 ml of M6095 + 5.00000 ml of M6115 + 6.25000 ml of M5816 + 6.25000 ml



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### **Metals STANDARD PREPARATION LOG**

| <u>Recipe</u> |                   |            |            | <b>Expiration</b> | <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    |
| 870           | ICPMS SPIKE SOL.B | MP83047    | 11/02/2024 | 12/14/2024        | Sarabjit Jaswal | None           | METALS_PIP       |               |
|               |                   |            |            |                   |                 |                | ETTE_3 (A)       | 11/04/2024    |

| FROM | 0.45000ml of M5962 + 5 | 5.00000ml of M5993 + | + 5.00000ml of M5 | i999 + 39.55000ml of I | MP83014 = Fina | al Quantity: 50.000 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    |
| 3962      | MG 10PPM FOR TUNE | MP83048    | 11/02/2024 | 12/14/2024  | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |                   |            |            |             |                 |                | ETTE_3 (A)       | 11/04/2024    |

**FROM** 0.01000ml of M5769 + 9.99000ml of MP83014 = Final Quantity: 100.000 ml





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### Metals STANDARD PREPARATION LOG

| Recipe               |            |            |            | <b>Expiration</b> | <u>Prepared</u> |                |                  | Supervised By |
|----------------------|------------|------------|------------|-------------------|-----------------|----------------|------------------|---------------|
| <u>ID</u> <u>NAI</u> | AME        | <u>NO.</u> | Prep Date  | <u>Date</u>       | <u>By</u>       | <u>ScaleID</u> | <u>PipetteID</u> | Mohan Bera    |
| 3894 TUN             | JNE 200PPB | MP83049    | 11/02/2024 | 12/14/2024        | Sarabjit Jaswal | None           | METALS_PIP       |               |
|                      |            |            |            |                   |                 |                | ETTE_3 (A)       | 11/04/2024    |

| FROM     | 2.00000ml of M6055 + 2.00000ml of MP83048 + 98.00000ml of MP83014 | = Final Quantity: 100.000 ml |
|----------|---|------------------------------|
| <u> </u> |   | •                            |

| Recipe    |             |         |            | <b>Expiration</b> | <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    | MP83050 | 11/02/2024 | 12/14/2024        | Sarabjit Jaswal | None           | METALS_PIP       |               |
|           |             |         |            |                   |                 |                | ETTE_3 (A)       | 11/04/2024    |

**FROM** 5.00000ml of M6115 + 75.00000ml of M5739 + 30.00000ml of MP83014 = Final Quantity: 100.000 ml





### **Metals STANDARD PREPARATION LOG**

| Recipe<br>ID<br>169 | <b>NAME</b><br>1:1HNO3           | NO.<br>MP83498 | Prep Date<br>12/09/2024 | Expiration Date 12/28/2024 | Prepared<br>By<br>Janvi Patel | <u>ScaleID</u><br>None | PipetteID<br>None | Supervised By Sarabjit Jaswal 12/09/2024 |
|---------------------|----------------------------------|----------------|-------------------------|----------------------------|-------------------------------|------------------------|-------------------|--|
| FROM                | 1250.00000ml of M6126 + 1250.000 | 00ml of W31    | 112 = Final Q           | uantity: 2500.00           | 00 ml                         |                        |                   |  |



| Supplier                    | ItemCode / ItemName   | Lot #                 | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
|-----------------------------|---|-----------------------|--------------------|----------------------------|---------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57042 / Mo, 1000 PPM,<br>125 ml                                   | 051722                | 05/17/2025         | 07/01/2022 /<br>bin        | 06/17/2022 /<br>jaswal          | M5192             |
| Supplier                    | ItemCode / ItemName   | Lot #                 | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58119 / K, 10000 PPM,<br>500 ml                                   | 071122                | 07/11/2025         | 09/01/2022 /<br>jaswal     | 07/21/2022 /<br>jaswal          | M5288             |
| Supplier                    | ItemCode / ItemName   | Lot #                 | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58113 / Aluminum (AI)<br>10,000PPM                                | 070622                | 07/06/2025         | 09/02/2022 /<br>jaswal     | 07/12/2022 /<br>jaswal          | M5289             |
| Supplier                    | ItemCode / ItemName   | Lot #                 | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
| EPA                         | ICV-1 / ICV (ICP/ICPMS)<br>STOCK SOLN                             | ICV-1014              | 01/01/2025         | 12/13/2023 /<br>bin        | 04/20/2021 /<br>bin             | M5294             |
|                             |   |                       |                    |                            | _                               |                   |
| Supplier                    | ItemCode / ItemName   | Lot #                 | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
| Supplier Inorganic Ventures | ItemCode / ItemName  6020CAL-1 / Calibration Standard Method 6020 | Lot #<br>S2-MEB711244 |                    | -                          |                                 |                   |
| Inorganic                   | 6020CAL-1 / Calibration   |                       | Date               | Opened By<br>08/07/2024 /  | <b>Received By</b> 04/01/2022 / | Lot #             |



| Supplier                    | ItemCode / ItemName                | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|------------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57138 / Sr, 10000 PPM,<br>125 ml   | 082922 | 08/29/2025         | 07/29/2024 /<br>jaswal     | 03/16/2023 /<br>jaswal         | M5476             |
| Supplier                    | ItemCode / ItemName                | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58120 / Ca, 10000 PPM,<br>500 ml   | 031523 | 03/15/2026         | 08/15/2023 /<br>jaswal     | 03/17/2023 /<br>bin            | M5498             |
| Supplier                    | ItemCode / ItemName                | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57182 / Pb, 10000 PPM,<br>125 ml   | 061522 | 06/15/2025         | 03/19/2023 /<br>bin        | 03/17/2023 /<br>bin            | M5513             |
| Supplier                    | ItemCode / ItemName                | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58126 / Fe, 10000 PPM,<br>500 ml   | 092122 | 09/21/2025         | 08/01/2024 /<br>Jaswal     | 03/17/2023 /<br>bin            | M5515             |
| Supplier                    | ItemCode / ItemName                | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57119 / Potassium (K)<br>10,000PPM | 120822 | 12/08/2025         | 01/08/2024 /<br>bin        | 03/17/2023 /<br>bin            | M5519             |
| Supplier                    | ItemCode / ItemName                | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute                    | 58024 / Chromium, Cr,              | 060523 | 06/05/2026         | 08/28/2023 /<br>jaswal     | 08/25/2023 /                   | M5658             |



| Supplier                           | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
|------------------------------------|---|--------------|--------------------|----------------------------|---------------------------------|-------------------|
| Absolute<br>Standards, Inc.        | 58025 / Mn, 1000 PPM,<br>500 ml                                   | 102623       | 10/26/2026         | 04/18/2024 /<br>jaswal     | 10/27/2023 /<br>jaswal          | M5698             |
| Supplier                           | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
| Inorganic<br>Ventures              | 6020ISS / 6020ISS, 10<br>ug/ml, Bi, Ho, In, 6Li, Rh,<br>Sc, TB, Y | T2-MEB709511 | 09/03/2026         | 08/07/2024 /<br>jaswal     | 04/11/2022 /<br>jaswal          | M5739             |
| Supplier                           | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.        | 58029 / Cu, 1000 PPM,<br>500 ml                                   | 071723       | 07/17/2026         | 10/01/2024 /<br>Jaswal     | 08/25/2023 /<br>jaswal          | M5751             |
| Supplier                           | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By  | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.        | 58112 / Mg, 10000 PPM,<br>500 ml                                  | 091823       | 09/18/2026         | 05/24/2024 /<br>Jaswal     | 01/03/2024 /<br>bin             | M5769             |
|                                    |   |              |                    |                            |                                 |                   |
| Supplier                           | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                 | Chemtech<br>Lot # |
| Supplier  Absolute Standards, Inc. | ItemCode / ItemName  57004 / Be, 1000 PPM, 125 ml                 | Lot # 102523 | -                  | -                          |                                 |                   |
| Absolute                           | 57004 / Be, 1000 PPM,   |              | Date               | Opened By<br>02/09/2024 /  | <b>Received By</b> 02/09/2024 / | Lot #             |



| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57027 / CO, 1000 PPM,<br>125 ml  | 091923 | 09/19/2026         | 05/31/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5800             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57033 / As, 1000 PPM,<br>125 ml  | 111323 | 11/13/2026         | 02/09/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5801             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57051 / Sb, 1000 PPM,<br>125 ml  | 120523 | 12/05/2026         | 08/07/2024 /<br>jaswal     | 01/03/2024 /<br>jaswal         | M5802             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58111 / Na, 10000 PPM,<br>500 ml | 122223 | 12/22/2026         | 08/01/2024 /<br>Jaswal     | 01/03/2024 /<br>jaswal         | M5806             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57115 / P, 10000 PPM,<br>125 ml  | 041723 | 04/17/2026         | 05/21/2024 /<br>Jaswal     | 02/09/2024 /<br>jaswal         | M5815             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration Date    | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57016 / S, 1000 PPM, 125<br>ml   | 122923 | 12/29/2026         | 05/20/2024 /<br>Jaswal     | 02/09/2024 /<br>jaswal         | M5816             |



| Supplier                    | ItemCode / ItemName                        | Lot #           | Expiration<br>Date          | Date Opened /<br>Opened By | Received Date /<br>Received By                    | Chemtech<br>Lot #     |
|-----------------------------|--|-----------------|-----------------------------|----------------------------|---|-----------------------|
| Absolute<br>Standards, Inc. | 57116 / S, 10000 PPM,<br>125 ml            | 071123          | 07/11/2026                  | 03/01/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal                            | M5817                 |
| Supplier                    | ItemCode / ItemName                        | Lot #           | Expiration<br>Date          | Date Opened /<br>Opened By | Received Date /<br>Received By                    | Chemtech<br>Lot #     |
| Absolute<br>Standards, Inc. | 57014 / Si, 1000 PPM, 125<br>ml            | 122023          | 12/20/2026                  | 03/06/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal                            | M5818                 |
| Supplier                    | ItemCode / ItemName                        | Lot #           | Expiration<br>Date          | Date Opened /<br>Opened By | Received Date /<br>Received By                    | Chemtech<br>Lot #     |
| Absolute<br>Standards, Inc. | 58030 / Zinc, Zn, 500 ml,<br>1000 PPM      | 111623          | 11/16/2026                  | 03/20/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal                            | M5819                 |
| Supplier                    | ItemCode / ItemName                        | Lot #           | Expiration<br>Date          | Date Opened /<br>Opened By | Received Date /<br>Received By                    | Chemtech<br>Lot #     |
|                             |  |                 |                             |                            |   |                       |
| Absolute<br>Standards, Inc. | 57015 / P, 1000 PPM, 125<br>ml             | 091123          | 09/11/2026                  | 05/01/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal                            | M5820                 |
|                             |  | 091123<br>Lot # | 09/11/2026  Expiration Date |                            |   | M5820  Chemtech Lot # |
| Standards, Inc.             | ml   |                 | Expiration<br>Date          | jaswal  Date Opened /      | jaswal  | Chemtech              |
| Standards, Inc.  Supplier   | ItemCode / ItemName PART A / ICSA (ICPMS ) | Lot #           | Expiration<br>Date          | Date Opened / Opened By    | paswal  Received Date / Received By  07/14/2022 / | Chemtech<br>Lot #     |



| Supplier                           | ItemCode / ItemName                             | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|------------------------------------|---|-----------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc.        | 57028 / Ni, 1000 PPM, 125<br>ml                 | 041124          | 04/11/2027         | 07/02/2024 /<br>Jaswal     | 06/11/2024 /<br>Jaswal         | M5961             |
| Supplier                           | ItemCode / ItemName                             | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.        | 57034 / Se, 1000 PPM,<br>125 ml                 | 060624          | 06/06/2027         | 07/02/2024 /<br>Jaswal     | 06/14/2024 /<br>Jaswal         | M5962             |
| Supplier                           | ItemCode / ItemName                             | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures              | CGMO1-1 /<br>MOLYBDENUM 125mL<br>1000ug/mL      | T2-MO720876     | 07/17/2027         | 08/07/2024 /<br>jaswal     | 02/22/2024 /<br>Jaswal         | M5976             |
| Supplier                           | ItemCode / ItemName                             | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures              | CGTI1-1 / TITANIUM<br>125mL 1000ug/mL           | T2-TI719972     | 06/17/2027         | 08/07/2024 /<br>jaswal     | 02/22/2024 /<br>Jaswal         | M5978             |
|                                    |   |                 |                    |                            |                                |                   |
| Supplier                           | ItemCode / ItemName                             | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Supplier  Absolute Standards, Inc. | ItemCode / ItemName 57092 / U, 1000 PPM, 125 ml | Lot #<br>060724 | -                  | -                          |                                |                   |
| Absolute                           | 57092 / U, 1000 PPM, 125                        |                 | Date               | Opened By<br>07/29/2024 /  | Received By 06/11/2024 /       | Lot #             |



| Supplier                    | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57040 / Zr, 1000 PPM, 125<br>ml                   | 071423       | 07/14/2026         | 07/29/2024 /<br>Jaswal     | 06/11/2024 /<br>Jaswal         | M5983             |
| Supplier                    | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CLPP-SPK-4 /<br>SOIL/WATER SPIKE SOLN<br>4, 125mL | V2-MEB742036 | 03/12/2029         | 10/04/2024 /<br>Jaswal     | 02/22/2024 /<br>Jaswal         | M5993             |
| Supplier                    | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CLPP-SPK-1 /<br>SOIL/WATER SPIKE SOLN<br>1, 125mL | T2-MEB721963 | 07/27/2027         | 09/04/2024 /<br>Jaswal     | 02/22/2024 /<br>kareem         | M5999             |
| Supplier                    | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57023 / V, 1000 PPM, 125<br>ml                    | 062424       | 06/24/2027         | 09/28/2024 /<br>jaswal     | 08/05/2024 /<br>Jaswal         | M6021             |
| Supplier                    | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57081 / TI, 1000 PPM, 125 ml                      | 0624724      | 06/27/2027         | 08/05/2024 /<br>kareem     | 08/05/2024 /<br>Jaswal         | M6023             |
| Supplier                    | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57082 / Pb, 1000 PPM,<br>125 ml                   | 061224       | 11/09/2026         | 08/05/2024 /<br>Jaswal     | 08/05/2024 /<br>Jaswal         | M6025             |



| Supplier                    | ItemCode / ItemName   | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot #     |
|-----------------------------|---|---------------------|--------------------|----------------------------|--------------------------------|-----------------------|
| Absolute<br>Standards, Inc. | 57048 / Cd, 1000 PPM,<br>125 ml                                   | 070124              | 07/01/2027         | 08/05/2024 /<br>kareem     | 08/05/2024 /<br>Jaswal         | M6028                 |
| Supplier                    | ItemCode / ItemName   | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot #     |
| Absolute<br>Standards, Inc. | 57047 / Ag, 1000 PPM,<br>125 ml                                   | 122823              | 12/28/2026         | 08/05/2024 /<br>kareem     | 08/05/2024 /<br>Jaswal         | M6030                 |
| Supplier                    | ItemCode / ItemName   | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot #     |
| Absolute<br>Standards, Inc. | 58113 / AI, 10000 PPM,<br>500 ml                                  | 011623              | 01/16/2026         | 08/07/2024 /<br>Jaswal     | 01/03/2024 /<br>Jaswal         | M6033                 |
| Supplier                    | ItemCode / ItemName   | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot #     |
| Seidler Chemical            | BA-9530-33 / Hydrochloric<br>Acid, Instra-Analyzed<br>(cs/6x2.5L) | 24D1562005          | 02/08/2025         | 08/09/2024 /<br>jaswal     | 08/01/2024 /<br>Janvi          | M6040                 |
| Supplier                    | ItemCode / ItemName   | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot #     |
|                             |   |                     | 00/04/0000         | 00/04/0004                 | 00/40/0004                     |                       |
| Inorganic<br>Ventures       | IV-STOCK-12 / ICP-MS<br>TUNING SOLUTION,<br>125mL                 | U2-MEB734294        | 06/21/2028         | 08/21/2024 /<br>Jaswal     | 08/19/2024 /<br>Jaswal         | M6055                 |
| _                           | TUNING SOLUTION,  | U2-MEB734294  Lot # | Expiration Date    |                            |                                | M6055  Chemtech Lot # |



Fax: 908 789 8922

| Supplier         | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|------------------|--|------------|--------------------|----------------------------|--------------------------------|-------------------|
| Seidler Chemical | BA-9598-34 / Nitric Acid,<br>Instra-Analyzed (cs/4x2.5L) | 24B1362001 | 05/04/2025         | 11/02/2024 /<br>Janvi      | 09/29/2024 /<br>Eman           | M6115             |

| Supplier         | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|------------------|--|------------|--------------------|----------------------------|--------------------------------|-------------------|
| Seidler Chemical | BA-9598-34 / Nitric Acid,<br>Instra-Analyzed (cs/4x2.5L) | 24D1062002 | 06/03/2025         | 12/03/2024 /<br>Janvi      | 11/12/2024 /<br>Janvi          | M6126             |
|                  |  |            |                    |                            |                                |                   |

| Supplier         | ItemCode / ItemName | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|------------------|---------------------|---------------------|--------------------|----------------------------|--------------------------------|-------------------|
| Seidler Chemical | DIW / DI Water      | Daily Lab-Certified | 07/03/2029         | 07/03/2024 /<br>lwona      | 07/03/2024 /<br>Iwona          | W3112             |



### Certificate of Analysis

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### 1.0 **ACCREDITATION / REGISTRATION**

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

CLPP-SPK-4

Lot Number:

V2-MEB742036

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** 100.0 ± 0.7 µg/mL

**ANALYTE** Arsenic, As **CERTIFIED VALUE** 

40.00 ± 0.26 µg/mL

Cadmium, Cd

50.00 ± 0.22 μg/mL

Lead, Pb

20.00 ± 0.09 µg/mL

Selenium, Se

 $10.00\pm0.04~\mu\text{g/mL}$ 

Thaillum, Ti

50.00 ± 0.22 µg/mL

Density:

1.016 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

| ANALYTE | METHOD     | NIST SRM# | SRM LOT#     |
|---------|------------|-----------|--------------|
| As      | ICP Assay  | 3103a     | 100818       |
| Cd      | ICP Assay  | 3108      | 130116       |
| Cd      | EDTA       | 928       | 928          |
| Cd      | Calculated |           | See Sec. 4.2 |
| Pb      | ICP Assay  | 3128      | 101026       |
| Pb      | EDTA       | 928       | 928          |
| Pb      | Calculated |           | See Sec. 4.2 |
| Sb      | ICP Assay  | 3102a     | 140911       |
| Se      | ICP Assay  | 3149      | 100901       |
| Se      | Calculated |           | See Sec. 4.2 |
| TI      | ICP Assay  | 3158      | 151215       |
| 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<sub>CRM/RM</sub>, where two or more methods of characterization are used is the weighted mean of the results:

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

 $X_i$  = mean of Assay Method i with standard uncertainty  $v_{char}$ 

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

ucher a = the errors from characterization

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

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/A

### 6.0 INTENDED USE

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

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

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

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit
- www.inorganicventures.com/TCT

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

March 12, 2024

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

### 11.2 Lot Expiration Date

- March 12, 2029
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

Paul R Saine

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



# Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

**Expiration Date:** 

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

**SDS Information** 

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

**NIST** SRM

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

1 of 2

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

|                               |              | ₩ !    | 묤            | Ве           | ן ל           | 炗     | As           | . 0           | ç     | 2             |  | I        |       |  |
|-------------------------------|--------------|--------|--------------|--------------|---------------|-------|--------------|---------------|-------|---------------|--|----------|-------|--|
|                               | 10.04        | 200    | A (2)        | 10.02        | 0.02          | 3     | 4            | 20.02         | 3     | <b>♦</b> 0.02 |  |          |       |  |
|                               | 2            | 2 8    | 3            | Ţ.           | ) {           | ,     | င္ပ          | 2             | ?     | 2             |  |          |       |  |
|                               | 70.02        | 2 6    | 3            | <0.02        | 20.02         | 3     | <u>6</u> .02 | 8             | 5     | Н             |  |          |       |  |
|                               | J.           | }      | 3            | G            | 2             | 2     | 달            | Ę             | , t   | Ų             |  |          |       |  |
|                               | 20:02        | 6 6    | 3            | 40.02        | 20.02         | 3     | 88           | 40.02         |       | 40.02         | TO SECURITION OF THE PARTY OF T |          |       |  |
|                               | 70           | 2 5    | <del>,</del> | 4            | ing.          | 4     | 5            | HO            | :     | H             |  | L        | 4     |  |
|                               | 20.02        | 20.02  | 3            | <b>∆</b> 0,2 | <0.02         | 3     | A<br>Si      | 40.02         | 1 1   | 40.02         | STORES STORES  | I dec Me | _1    |  |
|                               | 20           | MIO    | 5,           | He           | Mn            | , ,   | <b>₹</b>     | 7             | 1     | E             | STATE OF THE PARTY | אפרשוט   | 5     |  |
| <li>(T) = Target analyte</li> | 40,02        | 20.02  | 5            | <b>∆</b> 0.2 | <0.02         |       | <b>≙</b> 01  | <0.02         |       | 40.02         |  | vernica  | 17:22 |  |
| jet anal                      | ×            | 7      | ,            | 9            | Pd            |       | <u>ک</u>     | Ş             | :     | Z.            |  | Con      |       |  |
| yte                           | 40.2         | \$0.02 |              | A) (2)       | <0.02         | 10.00 | 3            | <0.02         | 40.02 | 2002          |  | יטא וכף- |       |  |
|                               | Sc           | Sm     | •            | 2            | RЪ            | 1     | <u> </u>     | Re            | 1.1   | P             |  | MU       |       |  |
|                               | <b>40.02</b> | 40.02  |              | <b>∆</b>     | <b>∆</b> 0,02 | 20.02 | 3            | 40.02         | 10.02 | 000           |  | Jg/mL)   |       |  |
|                               | Ta           | ç      |              | ę            | Z             | 30    | >            | S.            | č     | 2             | Spiletolin   |          | ı     |  |
|                               | Ð.02         | 40.02  | 40.04        | 3            | 40.2          | 20.02 | 3            | <b>∆</b> 0.02 | 7.03  | à             |  |          |       |  |
|                               | Ti           | Sn     | 111          | 1            | 7             | 11    | 3            | Te            | 10    |               |  |          |       |  |
|                               | <0.02        | 40.02  | 20.07        | 3            | <b>₩</b>      | 20.02 | 3            | <0.02         | 20.02 | 500           | Age of the owner that the  |          |       |  |
|                               | Zt           | Zn     |              | <            | <b>¥</b>      | ~     | 7            | d             | *     |               |  |          |       |  |
|                               | <0.02        | <0.02  | 20.02        | 3            | 40.02         | 20.02 |              | 40.02         | 70.02 |               | MATERIAL SECTION AND ADDRESS OF THE PERSON A |          |       |  |

### Physical Characterization:

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

Certified by:

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

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

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

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

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

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

Part # 57048

2 of 2

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## Certified Reference Material CRM

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

R: 815/24 M6025

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

Nitric Acid

Lot Number: Description: Lead (Pb)

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

**Expiration Date:** 

110926

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

110923

Revience

<u>=</u> 40.0

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

| E P.3             | 1. Lead(II) nitrate (Pb)               | Compound   |
|-------------------|--|--|
| [1] Spectrum No.1 | IN029 PBD122016A1                      | Lot Nominal Purity Uncertainty Assay Target Actual RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) |
| 17.284 5          | 11                                     | Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) \(\begin{array}{c}\)                               |
| 7                 | 99.999                                 | Purity<br>(%)  |
| של מו             | 0.10                                   | Uncertainty<br>Purity (%)  |
|                   | 62.5                                   | Assay<br>(%)   |
| To a line         | 32.0006                                | Target<br>Weight (g)   |
|                   | 10000 99.999 0.10 62.5 32.0006 32.0040 | Actual<br>Weight (g)   |
|                   |  | Actual<br>Conc. (µg/mL)  |
|                   | 20.0                                   | Actual Uncertainty onc. (µg/mL) +/- (µg/mL)  |
|                   | 10099-74-8                             | (Solv  |
|                   | 10001.1 20.0 10099-74-8 0.05 mg/m3     | Actual Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (ug/mL) +/- (ug/mL) CAS# OSHA PEL (TWA) LD50         |
|                   | intryns-rat 93 mg/kg 3128              | tached pg.)<br>LD50  |
|                   | 3128                                   | NIST<br>SRM  |

| 110 120 130 140 150 | 10 20 30 40 |  |
|---------------------|-------------|--|
| 120 130 140         | 20          |  |
| 120 130 140         | 30          |  |
| 130                 | 30          |  |
| 130 140             |             |  |
| 40                  |             |  |
|                     | ð           |  |
|                     | 6           |  |
| )<br>()             |             |  |
| , o                 |             |  |
|                     | 50          |  |
| 3                   |             |  |
|                     | <b>6</b> 0. |  |
|                     |             |  |
| 770                 | 70          |  |
| <u>→</u>            | 80          |  |
| 180                 |             |  |
| *9                  | 9           |  |
| 0:                  | 90          |  |
| 200                 | 100         |  |

Part # 57182

1 of 2



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

|    |       |     |       |    |              | ı  | I race Me    | Metals | Verifica      | T S      | by ICP-       | NS ( | μg/mL)   |    |       | 1             |                |                        |                                |
|----|-------|-----|-------|----|--------------|----|--------------|--------|---------------|----------|---------------|------|----------|----|-------|---------------|----------------|------------------------|--------------------------------|
|    | 40.02 | 8   | 40.02 | Dy | 40.02        | Hf | A).02        |        | <b>4</b> 0.02 | Z:       | <b>∆</b> 0,02 |      | P        | -  | <0.02 | - d0.02   Se  | - d0.02   Se   |                        |                                |
| S  | A).02 | ದಿ  | 40.2  | Ē. | 40.02        | Но | <b>40.02</b> | 둗      | <b>40.02</b>  | <b>Z</b> | 40.02         | _    | Re       | Re |       | <b>△</b> 0.02 | <0.02 Si <0.02 | <0.02 Si <0.02         |                                |
| S  | 40.2  | င္ပ | 40.02 | 핕  | 40.02        | P. | 40.02        | Mg     | <0.01         | ဝွ       | <0.02         |      | 짪        |    | 40.02 | <0.02 Ag .    | <0.02 Ag <0.02 |                        | 40.02 Ag 40.02 TI 40.02        |
| Ba | 40.02 | ಭ   | 40.02 | ନୁ | <b>40,02</b> | F  | A0.02        | M      | <0.02         | 골        | 40,02         | _    | 장        |    | 40.02 | <0.02 Na      | <0.02 Na <0.2  | <0.02   Na   <0.2   Th | <0.02   Na   <0.2   Th   <0.02 |
| Be | 40.01 | ភ   | A.02  | ୍ଲ | <b>₩</b>     | 귡  | 40.2         | 9H     | <b>∆0.2</b>   | שי       | 40.02         | 727  | <u>~</u> |    | 40,02 | 40.02 Sr .    | 40.02 Sr .     | <0.02 Sr <0.02 Tm      | <0.02 Sr <0.02 Tm              |
| В  | A).02 | င   | 40.02 | ද  | A0.02        | 2  | <b>40.02</b> | Mo     | <0.02         | ₽        | 40.02         | 70   | B        |    | 40.02 | 40.02 S       | 40.02 S 40.02  | <0.02 S <0.02 Sn       | <0.02 S <0.02 Sn <0.02         |
| Œ  | 40.02 | ξ   | 40.02 | Au | 40.02        | 3  | T            | Z      | <0.02         | ×        | 40.2          | _    | જ        | Т  | <0.02 | <0.02 Ta ·    | √0.02 Ta √0.02 | 40.02 Ta 40.02 Ti      | 40.02 Ta 40.02 Ti              |

### Physical Characterization:

(T)= Target analyte

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

Sor I Mill

- \* 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

M.5192 R: 06/17/2

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

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

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

## Certified Reference Material CRM



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

|                     |       | u     | -         | D.    | Ве           | Ва    |                | D 6   | Sb       | A     | -                 |             |  |
|---------------------|-------|-------|-----------|-------|--------------|-------|----------------|-------|----------|-------|-------------------|-------------|--|
|                     |       | -     | -         |       | 10.0         |       |                |       |          | -     |                   |             |  |
|                     |       | .02   | 70.       | 3 :   | 0            | 22    | 1              | 5     | 8        | .02   | The second second |             |  |
|                     |       | 5     | 8         | ,     | <del>?</del> | င္ပ   | 6              | ,     | <u>ٿ</u> | 8     | The second second |             |  |
|                     |       | 40.02 | 20.02     | 0 0   | 3            | 40.02 | 20.02          | 2     | 402      | 40.02 |                   |             |  |
|                     |       | Au    | Ç         | 2     | 3<br>-       | වු    | ᄪ              | į     | Ţ.       | Dy    |                   |             |  |
|                     |       | 0.02  | <0.02     | 20.02 | 3            | <0.02 | <0.02          | 20.02 | 3        | <0.02 |                   |             |  |
|                     |       | 3     | 7         | 7     | 71 1         | ='    | Б              | 110   | F        | 斯     |                   |             |  |
|                     | 10102 | 9     | ∆<br>0.02 | 202   | 000          | 9     | 40.02          | 20.02 | 3        | 40.02 |                   | 1 000       | Trace V  |
|                     |       | Ę     | Mo        | 9H    |              | 5     | Mg             | E     | 1 !      | =     |                   | וכימוס      | otolo<br>otolo   |
| (T)=1               | 10.07 | 3     | -         | 40.2  | 20.02        | 3     | 40.01          | 20.02 | 000      | A) 02 |                   |             | Varifica   |
| (T)= Target analyte | ,     | ۲ :   | ¥         | ď     | 2            | 2     | ဝွ             | 8     | 1 2      | N.    |                   | בוכו        | ±.   |
| nalyte              | 7.05  | 2 5   | 3         | 40.02 | 20.02        | 3     | 40.02          | 40.02 | 10.04    | A003  |                   | DY ICT-IVIC | 20 2   |
|                     | 36    | 3 6   | Si .      | Ru    | KO           | 2 :   | R <sub>r</sub> | Re    | 7        | P     |                   | in Chi      | 2  |
|                     | 20.02 | 10.01 | 3         | <0.02 | 20.02        | 000   | 4000           | 40.02 | 20.02    | 000   |                   | 9/1111      | ~ / /  |
|                     | la    | 1 6   | 2         | Sr    | Na           | . 6   | Δσ             | S:    | ×        | 2     |                   |             |  |
|                     | <0.02 | 20.02 | 3         | 40.02 | 40.2         | 20.02 | 3              | 40.02 | 2.0      |       |                   |             |  |
|                     | 11    | JI.   | ,         | Ī     | H            | =     | 3              | E.    | 10       |       |                   |             |  |
|                     | <0.02 | 20.02 |           | 40.02 | 40.02        | 20.02 | 3              | <0.02 | <0.02    |       |                   |             |  |
|                     | Z     | 9     | 1 ,       | ~     | 4,4          | <     | =              | _     | *        |       |                   |             |  |
|                     | <0.02 | <0.02 |           | A000  | <0.02        | 20.02 | 5              | 40.02 | <0.02    |       |                   |             | The second secon |

### Physical Characterization:

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

Certified by:

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

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CERTIFIED WEIGHT REPORT:

Part Number:

Lot Number:

58119 071122

## Certified Reference Material CRM

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

f O 12022

Lot #

Solvent: 20510011

Nitric Acid

Description: Potassium (K)

Recommended Storage: Ambient (20 °C)

**Expiration Date:** 

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

Weight shown below was diluted to (mL): 2000.02

071125 (<u>m</u>L

2%

40.0

Nitric Acid

Formulated By:

Lawrence Barry

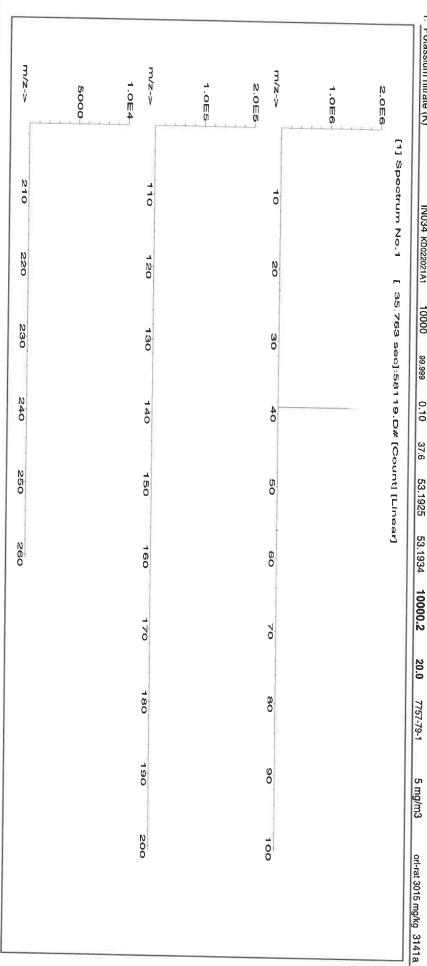
071122

Herronce

6UTB 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas 071122

 Potassium nitrate (K) IN034 KD022021A1 RM# Number Ĕ Conc. (µg/mL) 10000 Nominal 99.999 Purity Uncertainty Assay (%) Purity (%) (%) 37.6 Weight (g) Target Weight (g) Conc. (µg/mL) Actual +/- (μg/mL) Uncertainty CAS# SRM

Expanded SDS Information
(Solvent Safety Info. On Attached pg.)
LD50



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

|    |       |     |       |          |               |    | Trace M | /letals        | Verifica            | ation | by ICP- | Š        | (µg/mL) |            |              |              |               | ١          |               |
|----|-------|-----|-------|----------|---------------|----|---------|----------------|---------------------|-------|---------|----------|---------|------------|--------------|--------------|---------------|------------|---------------|
| I  |       |     |       |          |               |    |         |                | 1000000             |       |         |          |         |            |              | l            |               |            |               |
| Al | <0.02 | Ω   | <0.02 | Dy       | <0.02         | H  | <0.02   | L              | <0.02               | Z     | <0.02   | P        | <0.02   | Se         | <0.2         | T)           | <0.02         | W          | <0.02         |
| Sb | <0.02 | ್ಣ  | <0.2  | 다        | <0.02         | H  | <0.02   | Lu             | <0.02               | ₹     | <0.02   | Re       | <0.02   | ≥:         | <0.02        | e            | <0.02         | = :        | <b>∆</b> 0.02 |
| As | <0.2  | င္ပ | <0.02 | E        | <0.02         | ln | <0.02   | Z<br>S         | <0.01               | ွှ    | <0.02   | <u>R</u> | <0.02   | Ag         | <b>△0.02</b> | Ⅎ            | <0.02         | <          | 4000          |
| Ba | <0.02 | స   | <0.02 | <u>S</u> | <0.02         | 4  | <0.02   | Mn             | <0.02               | Pd    | <0.02   |          | S0.02   | <u>Z</u> , | <0.2         | 7            | 2             | <b>∮</b> . | 2 3           |
| Ве | <0.01 | Ů   | <0.02 | Ga       | 40.02         | Fe | 40.2    | Hg             | <0.2                | P     | <0.02   | ₽        | A) (7)  | <u>~</u>   | <0 00 in     | <del>-</del> | 3 5           | < ;        | 2 8           |
| ₽. | <0.02 | င   | <0.02 | ନୁ       | <b>△</b> 0.02 | Z  | <0.02   | M <sub>o</sub> | <0.02               | ¥     | <0.02   | Î        | <0.02   | n :        | 2003         | 3            | 3 6           | 7,         | 3 8           |
| В  | <0.02 | Cu  | <0.02 | Au       | <0.02         | Pв | <0.02   | <u>R</u>       | <0.02               | ~     | -1      | Sc.      | <0.02   | <u>.</u>   | ∆.02         | <u> </u>     | ∆.65<br>20.02 | 7.7        | A0.02         |
|    |       |     |       |          |               |    |         |                | (T) Toward annihity |       |         |          |         |            |              |              |               |            |               |

Physical Characterization:

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

Part # 58119

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Part # 58113



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

| 4T   | 1             |
|--|---------------|
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|  |               |
|  | Ti            |
| \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | To Te Tim Son |

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.
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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).

2 of 2

Part # 58113



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.

**CAUTION:** Read instructions carefully before opening bottle(s) and proceeding with

the analyses.

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

> Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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

ICV1-1014

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

Page 1 of 2



RMs ICV 1, 5, 6 SFAM.docx



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

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

ICV1-1014

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

ICV5-0415

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

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K<sub>3</sub>Fe(CN)<sub>6</sub>, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

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



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

Matrix:

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

5% (v/v) HNO3

Catalog Number: 6020CAL-1 Lot Number: S2-MEB711244

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<br>Aluminum, Al | CERTIFIED VALUE<br>20.01 ± 0.08 μg/mL | ANALYTE<br>Antimony, Sb | CERTIFIED VALUE<br>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<br>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<sub>CRM/RM</sub>, where two or more methods of characterization are Certified Value, X<sub>CRM/RM</sub>, where one method of characterization used is the weighted mean of the results: is used is the mean of individual results: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub> Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u<sub>char a</sub> = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u<sub>char a</sub> = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) u<sub>lts</sub> = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u<sub>ts</sub> = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit <a href="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

**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

| <ul> <li>Sealed TCT Bag Open Date:</li> </ul> |  |
|---|--|
|---|--|

- 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<br>IA | <0.02 | ొ  | <0.02 | δ  | <0.02  | HF  | <0.02    | ï     | <0.02    | Z     | <0.02     | 占    | <0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.0 | 3   | 25.   | É   | 89    | 100 | 000    |
| Sb       | <0.02 | ටී | <0.2  | Ţ, | CD 02  | H   | 2007     | 1     | 2000     | 11.16 | 000       | £    |  | 3 8 | 1     | 2   | 70.02 | A   | 70.02  |
| A        | 4     | ,  | 100   | i  | 100  | 2   | 70.00    | 7     | 70.0>    | D.    | 70.02     | 2    | 40.02  | 2   | <0.02 | E . | <0.05 | ם   | <0.02  |
| AS       | 7.02  | 3  | Z0:07 | 2  | <0.02  | 드   | <0.02    | Mg    | ₹0.07    | ő     | <0.02     | Rh   | <0.00  | Ag  | 2007  | F   | 50 9  | 77  | 6      |
| Ha       | €     | ێ  | 2002  | 3  | 5000   | ,1  | 000      | >     | 200      | i     |           | 1    | ***************************************                      | 0   | 70.05 | 1   | 70.07 | >   | 70:05  |
|          | 4     | 3  | *0.00 | 3  | 7000   | =   | 70.05    | IMIM  | 70:0>    | 2     | <0.02     | Rb   | Q.02   | Z   | 8     | Ę   | 200   | 5   | 2007   |
| Be       | <0.01 | Ö  | <0.02 | Ğ  | <0.02  | Ę.  | <0.2     | Ho    | <0.2     | ۵     | 200       | å    | 6  | į,  | 1 6   | Ę   | 0.00  | ; ; | 70:05  |
| ä        | 200   | ځ  | 0000  | Č  | 000  | ,   |          | 0 ,   |          |       | 10.04     | 7    | 70.07  | วี  | 70'05 | E   | 70.05 | >-  | \$0.05 |
| 7        | 70.07 | 3  | Z0.02 | 5  | 20102  | 2   | 40.02    | Wo    | ₹0.05    | Ž,    | <0.02     | Sm   | <0.02  | v.  | 2002  | Ca  | 2000  | 7   | 000    |
| 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

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

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

All standard containers are meticulously cleaned prior to use.

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

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

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

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



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

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

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





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

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

|            |  |              |             |                                       |  | Trace Me         | tals      | Verificat       | ioi      | by ICP-N | MS (  | $(\mu g/m\Gamma)$  |  | r  |  |   |  |   |
|------------|--|--------------|-------------|---------------------------------------|--|------------------|-----------|-----------------|----------|----------|---|--|--|--|--|---|--|---|
| SHEW SHEET | STATE OF THE PARTY OF                        |              |             |                                       | SIGNATURE .  | STON SAFETY SAGE | S. Parlie | THE SHARE SHARE | Series . |          | Sec.  | STREET, STREET | THE PERSON   | THE PERSON NAMED IN  | THE PERSON   |   |  |   |
| 707        | ප  | <0.02        | δ           | 40.05                                 | H  | <0.02            | II.       | <0.02           | Z        | <0.02    | ď   | <0.02  | Se   | <0.2   | 13   | <0.02   | ≥  | <0.02   |
| 700        | రో   | H            | 卢           | ₹0.02                                 | 윒  | 20.02            | 3         | <0.02           | ź        | <0.02    | 2   | <0.02  | ន  | <0.02  | Į.   | 40.02   | Þ  | ₹0.05   |
| 07         | පී   | <b>40.02</b> | 超           | <0.02                                 | Я  | <0.02            | Mg        | 40.01           | ő        | <0.02    | 쥪   | <0.02  | Ag   | <0.02  | F  | <0.02   | >  | <0.02   |
| 707        | ర  | <0.02        | පි          | <0.02                                 | 片  | <0.02            | Mn        | <0.02           | Z        | <0.02    | 2   | <0.02  | ž  | <0.2   | Ę  | <0.02   | ¥9   | 40.02   |
| 100        | Ö  | <0.02        | ජි          | 40.02                                 | Ŗ  | <0.2             | Hg        | 40.2            | م        | <0.02    | æ   | <0.02  | స  | <0.02  | Ę,   | <0.02   | ¥  | ₹0.05   |
| 707        | රි   | 40.02        | පි          | ₹0.02                                 | 3  | 20.0≥            | 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<br>6.00<br>6.00<br>6.00<br>6.00<br>6.00 |              | 3 5 5 5 5 5 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | Cd               | Cd        | Cd              | Cd       | Cd       | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02           Ca         T         En         -0.02         Ho         -0.02         Li         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mg         -0.02           Cr         -0.02         Ga         -0.02         Fe         -0.02         Mn         -0.02           Co         -0.02         Ga         -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         Nh         -6.002         Rb           Ce         -6.002         Eu         -6.002         Ir         -6.002         Mn         -6.002         Rb         -6.002         Rb           Cr         -6.002         Ga         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02         Ru           Co         -6.002         Ga         -6.002         La         -6.002         Rr         -6.002         Rr           Co         -6.002         Ga         -6.002         Pr         -6.002         Rr         -6.002         Sr           Cu         -6.002         Au         -6.002         Pr         -6.002         Rr         -6.002         Sr | Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02           Ca         T         Ba         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02           Ce         -0.02         Bu         -0.02         Ir         -0.02         Mg         -0.01         Os         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Mn         -0.02         Pr         -0.02         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           Cu         -d002         Au         -d002         Nd         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr | 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         Ba         -0.02         Na         -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

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

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

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

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

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

SRM

| 1. Lead(II) nitrate (Pb) | INO29 PBD122016A1 | 10000                                 | 88.888 | 0.10  | 62.5     | 32.0006   | 32.0041 10001.1 |     | 20.0 | 10099-74-8 | 0.05 mg/m3 | intryne-rat 83 mo/kg 3128 | 3128 |
|--------------------------|-------------------|---------------------------------------|--------|-------|----------|-----------|-----------------|-----|------|------------|------------|---------------------------|------|
| 1.0E7                    | [1] Spectrum No.1 | 17.284 sec]:58182.D# [Count] [Linear] | ec]:58 | 82.D* | Cour     | nt] [Line |                 | 1   |      |            |            | p<br>h                    |      |
| S.0E8                    |                   |                                       |        |       |          |           |                 |     |      |            |            |                           |      |
| m/z->>                   | 0 P               | O                                     |        | .0    |          | 0.00      | 9               | 02  |      | 08         | 0          | 100                       |      |
| 1.0E6                    |                   |                                       |        |       |          |           |                 |     |      |            |            |                           |      |
| m/z->                    | 1100              | 190                                   |        | 04    | i)<br>Er | 150       | 160             | 170 | , T  | 180        | 0.00       | 000                       |      |
| 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 | 3-5-40. 1. 1. 1. 3-2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. | -  | THE PROPERTY OF THE PARTY OF TH | CAMPBOOK. |               |      |              |    | 2            | Commence of the last |               |          |              |     |              |
| ₹         | <0.02           | ਝ   | <0.02          | Ď              | <0.02  | HŁ | <0.02  | Ľ         | <0.02         | ž    | <0.02        | ď  | 2002         | 3                    | 202           | 4        | 200          |     | 000          |
| Sp        | <0.02           | ථ   | <0.2           | ď              | 200  | H  | 200  | ž         | 969           | 1    | 9            | è  | 2000         | 3                    | 100           | 2        | 20.02        | *   | 7mm>         |
| V V       | ç               | d   | 1 6            | ,              |  | 2  | 777  | 3         | 70:05         | ON T | 70.02        | 2  | 7070>        | 7                    | ₹0.02         | <u>e</u> | \$0.02       | Þ   | <b>40.02</b> |
| ĉ         | 7.02            | 3   | Z0:02          | S S            | Q0:05  | 크  | 8002   | Mg        | <b>40.0</b> 1 | ර    | <b>40.02</b> | Rh | <b>40.02</b> | Ao                   | <b>CD CD</b>  | F        | 200          | 2   | 8            |
| Ba        | <0.02           | రో  | <0.02          | 3              | <0.02  | 4  | <0.02  | M         | <0.02         | Ъ    | 2002         | 40 | 8            | 0 2                  | 6             | į        | 70:00        | - E | 70.00        |
| Be        | <0.01           | Ö   | <0.02          | S              | <0.02  | Ę, | 402  | H         | 5             | . 0  | 600          |    | 7000         | 2 0                  | 707           | = 6      | 20.02        | Q.  | Z0.02        |
| ž         | 2000            | S   | 200            | 2              | 8  | -  | 9 6  | 9         | 700           | - é  | 20.02        | 1  | 70'05        | ă                    | <b>40.002</b> | Ħ        | <b>40.02</b> | ×   | <0.02        |
| i         | 200             | 3 6 | 70.00          | 5 .            | 20.02  | 3  | 70:05  | WIO       | <0.02         | Σ,   | <0.02        | SH | <0.02        | S                    | <0.02         | Sn       | <b>40.02</b> | Z   | 40.02        |
|           | 70.02           | 3   | 70'02          | Au             | <0.02  | £  | T  | ž         | 40.02         | ×    | \$<br>\$     | S  | <0.02        | Ę                    | <b>CD 02</b>  | Ę        | 29           | 2   | 8            |

Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 061522

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

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## Certified Reference Material CRM

03/12/23

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

CERTIFIED WEIGHT REPORT: 1. Iron (Fe) Compound Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: m/z-> m/z-> 5.0E7-5.0E7-1.0E8 1.0E8-2.0E4 NIST Test Number: 1.0E4 **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 [ 30.763 sec]:58126.D# [Count] [Linear] 110 5 IN346 2224912-500 58126 092122 Iron (Fe) 10000 **6UTB** 092125 Ambient (20 °C) Number Εţ 120 20 Conc. (µg/mL) 5000.1 10000 Nominal 130 30 99.995 5E-05 Balance Uncertainty Purity Uncertainty Assay 0.12 Flask Uncertainty 8 Purity (%) 0.10 140 0 Solvent: 20510011 100.0 8 7.0% 50.0034 Weight (g) 350.0 Lot # 150 50 Target (III) Nitric Acid Weight (g) Conc. (µg/mL) Nitric Acid 50.0111 Actual 160 60 10001.5 Actual 170 70 +/- (µg/mL) Expanded Reviewed By: Formulated By: Uncertainty 20.0 Giovannie 7439-89-6 0.8 180 CAS# (Solvent Safety Info. On Attached pg.) Giovanni Esposito Pedro L. Rentas Japane 1 OSHA PEL (TWA) SDS Information 190 90 5 mg/m3 200 100 orl-rat 7500mg/kg 3126a 092122 092122

SRM TSIN

m/z->

210

220

230

240

250

260

## Certified Reference Material CRM





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

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

(T)= Target analyte

## Physical Characterization:

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



Certified by:

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

All standard containers are meticulously cleaned prior to use.

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

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

2 of 2

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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

Description: Lot Number:

58119 120822 Potassium (K)

Solvent: 20510011 Nitric Acid

Lot #

Javanva

アイクラクスで

60.0 <u>a</u>

2%

Nominal Concentration (µg/mL):

NIST Test Number:

**6UTB** 10000 Ambient (20 °C) 120825

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

3000.4

5E-05 Belance Uncertainty

0.06 Flask Uncertainty

Nitric Acid

Formulated By:

Giovanni Esposito

120822

Reviewed By:

Pedro L. Rentas

120822

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

| m/z-y                         | 5000   | m/z-> | 1.0E5 | m/z->                                 | 1.000 | 2.016 |
|-------------------------------|--|-------|-------|---------------------------------------|-------|-------|
| whiteless was commented about | and distinct manage gapen game in the six street digenera as |       |       | , , , , , , , , , , , , , , , , , , , |       |       |
| 210                           |  | 110   |       | ō                                     |       |       |
| J                             |  | 0     |       |                                       |       |       |
| 220                           |  | ก     |       | N.                                    |       |       |
|                               |  |       |       |                                       |       |       |
| 230                           |  | 130   |       | <b>3</b>                              |       |       |
|                               |  |       |       |                                       |       |       |
| N<br>4<br>0                   |  | 4.    |       | 4                                     |       |       |
|                               |  |       |       |                                       |       |       |
| N<br>U                        |  | 150   |       | O.                                    |       |       |
|                               |  |       |       | -                                     |       |       |
| 20<br>0                       |  | 160   |       | 0                                     |       |       |
|                               |  |       |       |                                       |       |       |
|                               |  | 170   |       | 8                                     |       |       |
|                               |  |       |       |                                       |       |       |
|                               |  | 180   |       | Ö                                     |       |       |
|                               |  |       |       |                                       |       |       |
|                               |  | 190   |       | 0                                     |       |       |
|                               |  | A.    |       |                                       |       |       |
|                               |  | 200   |       | 100                                   |       | ,     |
|                               |  |       |       |                                       |       |       |

Lot # 120822

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

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

## Physical Characterization:

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

Certified by:

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

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

Lot # 120822

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

www.absolutestandards.com



## Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

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

Part # 58024



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

|               |              |                  | _     |              |              |              | _     |  |              | = |
|---------------|--------------|------------------|-------|--------------|--------------|--------------|-------|--|--------------|---|
|               | B            | ᄧ                | Ве    | В            | As           | Sb           | Δ     | Monthly  |              |   |
|               | A).02        | <b>4</b> 0.02    | 40,01 | <b>A</b> .02 | <b>40.2</b>  | △0.02        | △0.02 |  |              |   |
|               | δ            | පි               | Ω     | င္တ          | දි           | ర్జ          | Ω     |  |              |   |
|               | <b>40.02</b> | <b>40.02</b>     | )     | 40.02        | 40.02        | 40,2         | △0.02 |  |              |   |
|               | Æ            | ဂ္ဂ              | වූ    | ନ୍ଥ          | 멸            | 녆            | Dy    | 80   |              |   |
|               | <b>40.02</b> | 40.02            | 40.02 | <0.02        | 40.02        | 40.02        | 40.02 | mineral differences  |              |   |
|               | 3            | Ľ                | स्र   | Ħ            | ď            | ᅜ            | Ж     | SHEET STATES   |              |   |
|               | <b>40.02</b> | 40.02            | 40.2  | A).02        | <0.02        | 40.02        | 40.02 |  | I race M     | 1 |
|               | 폺            | Мо               | В.    | Ķ            | ВМ           | Ē            | П     | MISSON ISSUE   | Metals       | 1 |
| 3             | A0.02        | 40.02            | 40.2  | 40.02        | 40,01        | <b>∆</b> .02 | 40.02 | SI RECEIPTOR   | Verification |   |
| Towns and the | ~            | 7                | 70    | 굕            | ô            | ₹            | 3     | SHEWARDS   | Clon         | - |
|               | <b>∆</b> 0.2 | 40.02            | 40.02 | 40,02        | 40.02        | 40.02        | 40.02 | THE PARTY OF THE P | by ICP-M     |   |
|               | Sc           | Sm               | 잗     | 공            | Rh           | æ            | Pr    |  | S (Hi        | 5 |
|               | <0.02        | <0.02            | <0.02 | 40.02        | 40,02        | 40.02        | <0.02 |  | g/mL)        |   |
|               | Ta           | S                | ñ     | Z.           | Ą            | Si.          | Se    |  |              |   |
|               | 40.02        | <0.02            | 40.02 | 402          | <b>40.02</b> | 40.02        | 402   |  |              |   |
|               | ==           | Sn               | Tm    | Ħ            | ᄇ            | 급            | 176   |  |              |   |
|               | 40,02        | 40.02            | 40,02 | 40,02        | <0.02        | 40,02        | <0.02 | Contract Contraction   |              |   |
|               | Z            | Zn               | ~     | 뀱            | ۷            | Ϥ            | W     | 可能を発展  |              |   |
|               | <0.02        | <b>&lt;</b> 0.02 | <0.02 | <0.02        | 40.02        | 40.02        | <0.02 | SALES OF SALES   |              |   |

(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

M5648 8: 10/23/23

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

CERTIFIED WEIGHT REPORT: 1. Manganese(II) nitrate tetrahydrate (Mn) Compound Nominal Concentration (µg/mL): m/z-> m/z-> M/Z-V 5.OE7 1.0≣8 5.0厘7 1,0E8 2.5E6 5.0E6 Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: [1] Spectrum No.1 Lot Number: Description: 110 210 0 58125 Number Part 58025 102623 **BTUB** 1000 Ambient (20 °C) 102626 Manganese (Mn) 071123 120 Number 20 Ĕ [ 34.243 sec]:57025.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 30 Vol. (mL) Pipette (mL) Conc. (µg/mL) 300.0 0.058 5E-05 Initial Flask Uncertainty Balance Uncertainty 240 140 Uncertainty 40 0.084 24002546 Nominal 2.0% Lot # 1000 250 150 0 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid Solvent: 10000.1 Initial <u>a</u> 60.0 260 160 00 Nitric Acid 1000.0 Final 170 0 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Expanded <u>2</u> 180 80 20694-39-7 CAS# (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) 90 Pedro L. Rentas Benson Chan SDS Information 5 mg/m3 200 100 ort-rat >300mg/kg D50 102623 102623 3132 SRM

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



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

|              | _  |       | !  | 3             | 3                                       | Š             | 2          | 5             | 3               | 3                     | ž             | 3                 | 7          | 3            | À.           | 3     | ?   | 3            | 0   |
|--------------|----|-------|----|---------------|---|---------------|------------|---------------|-----------------|-----------------------|---------------|-------------------|------------|--------------|--------------|-------|-----|--------------|-----|
| A<br>20.02   | Zn | A).02 | S  | &<br>.02      | S                                       | <b>√0.02</b>  | Sm         | 40.02         | 7               | 60.02                 | Mo            | <b>40.02</b>      | F          | <0.02        | දි           | 40.02 | ප   | <b>∆</b> .02 | 멾   |
| <b>△0.02</b> | ×  | 40.02 | Tm | 40.02         | Sr                                      | <0.02         | Ru         | <0.02         | קי              | 40.2                  | Ж             | 40.2              | Fe         | 40.02        | Ç            | <0.02 | ť   | 40.01        | Ве  |
| A).02        | 47 | 40.02 | Ħ  | 40.2          | Na                                      | <0.02         | RЬ         | <0.02         | Pd              | Н                     | M             | <0.02             | <u>,</u> F | <0.02        | S            | <0.02 | ဂ္ဂ | 40.02        | Ва  |
| A<br>20.02   | <  | 40.02 | ∄  | <b>∆</b> 0.02 | Ą                                       | <0.02         | 쫎          | 40.02         | õ               | 40.01                 | Mg            | 40.02             | 'n         | <0.02        | 덜            | <0.02 | င္ပ | 82           | As  |
| A0,02        | Ϥ  | 40.02 | Te | A0.02         | S                                       | <0.02         | ₽,         | 40.02         | \$              | 40.02                 | Ę             | <b>6.02</b>       | Ж          | <b>₹0.02</b> | 퍾            | <0.2  | ប្ច | 40.02        | Sb. |
| <b>40.02</b> | ₩  | <0.02 | 끕  | 40.2          | 8                                       | <0.02         | 2          | <0.02         | Z               | 40.02                 | E             | <0.02             | Hf         | <0.02        | Dy           | <0.02 | δ   | <b>40.02</b> | ≥   |
|              |    |       |    |               | 200000000000000000000000000000000000000 | Wassing Sales | West State | SCHOOL SOURCE | <b>BREEDOWN</b> | SESTIMATION OF STREET | WILLIAM STATE | Hermone Committee | Property.  | SANDSCHIEBER | SALES STATES |       |     | Section 1    |     |
|              |    |       |    |               |   | J/mL)         | in Chi     | by ICP-N      | tion            | verifica              | letais        | I race M          |            |              |              |       |     |              | Γ   |
|              |    |       |    |               |   |               |            |               |                 |                       |               |                   |            |              |              |       |     |              |     |
|              |    |       |    |               |   |               |            |               |                 |                       |               |                   |            |              |              |       |     |              |     |

## Physical Characterization:

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

Certified by:

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

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

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CERTIFIED WEIGHT REPORT



Certified Reference Material CRM

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

R:8/25) Lot # Solvent:

21110221

Nitric Acid

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

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

(mL)

40.0

Nitric Acid

Formulated By:

Benson Chan

071723

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

Part

Lot

Dilution

Initia

Uncertainty

Nominal

Initial

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

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

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

071723

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

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

|                      | [           | 9 9   | , E           | , <u>H</u>       | Ą                | . S          | · >   | 1000   | Γ        |   |
|----------------------|-------------|-------|---------------|------------------|------------------|--------------|-------|--|----------|---|
|                      | F           | _     |               |                  |                  | _            |       | Statement of the last of the l |          |   |
|                      | 20.02       | 200   | 8 2           | 20.02            | 40.2             | 20.02        | 0.02  |  |          |   |
|                      | 2           | . წ   | . τ           | <u>က</u>         | င္စ              | წ            | Ω     |  |          |   |
|                      | -           | 40.02 | 0.02          | A).02            | 0.02             | <b>∆</b> 0.2 | 40.02 | The second second  |          |   |
|                      | A           | - Ge  | ဂ္ဂ           | S                | 퍨                | 耳            | Dy    |  |          |   |
|                      | 40.02       | 40.02 | A) 02         | 40.02            | 40.02            | 40.02        | <0.02 |  |          |   |
|                      | 198         | F     | क्र           | F,"              | 5                | Ήο           | Hf    | DESTRUCTION OF THE PERSON NAMED IN   |          |   |
|                      | 40.02       | 40.02 | 40,2          | 40.02            | 40.02            | 40.02        | <0.02 | HILIPAGESTARING SHIPE  | Irace M  | 1 |
|                      | Z           | Мо    | ВН            | Min              | Mg               | £            | Ľ.    | N/S/GREEN  | etais    |   |
| (T) = Tarnot analyto | 40,02       | 40.02 | 82            | <0.02            | <0.01            | <0.02        | <0.02 | MINISTERNATION OF THE PERSON NAMED IN  | Verifica |   |
| de anak              | ×           | 29    | ъ             | ъ                | õ                | \$           | Z     | STATES NAMED IN  | tion     |   |
| 7                    | <b>∆0.2</b> | 40.02 | 40.02         | <b>0.02</b>      | <0.02            | 40.02        | <0.02 | Michigan Described   | oy ICP-N |   |
|                      | Sc          | Sm    | Ru            | Rb.              | Rh.              | æ            | 7     |  | SUE      | , |
|                      | 40.02       | 40.02 | 40.02         | 40.02            | 40.02            | <0.02        | 40.02 |  | J/mL)    | , |
|                      | Ta          | Ø     | Ş.            | Z                | À                | Si           | še    |  |          |   |
|                      | 40,02       | 40.02 | 40.02         | 40.2             | 40.02            | <0.02        | <0.2  |  |          |   |
|                      | 11          | Sn    | Tm            | Ħ                | ∄                | <b>.</b>     | Tb    |  |          |   |
|                      | 40.02       | 40,02 | <0.02         | <0.02            | 40.02            | 40.02        | <0.02 |  |          |   |
|                      | Zr          | 25    | ×             | \$               | <                | ٦            | W     | THE REAL PROPERTY.   |          |   |
|                      | <0.02       | 40.02 | <b>♦</b> 0.02 | <b>&lt;</b> 0.02 | <b>&lt;</b> 0.02 | <0.02        | <0.02 |  |          |   |

(I) = larget analyte

## Physical Characterization:

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

Certified by:

2 of 2

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

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

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

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

\* 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 маровгозат Compound Nominal Concentration (µg/mL): m/z-> M/2-> m/z-> Weight shown below was diluted to (mL): Recommended Storage: 2.0≡4 1.0E4 5.0E5 1.0E6 1000 2000 NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 쭕 **BTUB** 58112 091823 10000 Ambient (20°C) (M5+18), (M5+16) 091826 Magnesium (Mg) Number 120 ğ 20 [ 19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.02 0.058 Flask Uncertainty 10000 Nominal 130 230 30 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) (%) 140 0.10 240 40 Solvent: 24002546 Nitric Acid 8.51 150 234.9118 Weight (g) Target Lot # Ē Weight (g) Conc. (µg/mL) 234.9126 Nitric Acid Actual 160 260 0 10000.0 Actual 170 6 +/- (µg/mL) Expanded Uncertainty Reviewed By: Formulated By: 20.0 180 80 13446-18-9 (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 Pedro L. Rentas Lawrence Barry 190 **SDS Information** Ö Z 200 100 orl-rat 5440 mg/kg 3131a 091823 091823 SRM

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

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

|   | [     | 171   | <u></u>  | (22)     | 5>        | Sb       | 5>         |   |               |   |
|---|-------|-------|----------|----------|-----------|----------|------------|---|---------------|---|
|   | ۴     | . 22. | <u>ਨ</u> | <u>a</u> | - 2       | <u> </u> |            |   |               |   |
|   | 40,02 | 0.02  | 10.00    | <0.02    | 402       | <0.02    | <0.02      |   |               |   |
|   | 5     | ප     | 유        | Ĉ        | ද         | ದ್       | Ω          | i |               |   |
|   | A).02 | 40.02 | 40.02    | 40.02    | △0.02     | 40.2     | <0.02      |   |               |   |
|   | Au    | ල     | Ga       | 2        | E         | 戽        | Dy         |   |               |   |
|   | <0.02 | <0.02 | <0.02    | <0.02    | <0.02     | <0.02    | <0.02      |   |               |   |
|   | 7     | La    | Fe       | <b>F</b> | Б         | Но       | 出          |   |               |   |
|   | <0.02 | 40.02 | 40.2     | △0.02    | <0.02     | <0.02    | <0.02      |   | Trace Mo      |   |
|   | Æ     | Mo    | Hg       | Mn       | Mg        | Ę        | <u>.</u> : |   | <b>letals</b> |   |
| Ì | <0.02 | <0.02 | 40.2     | <0.02    | <b></b> ] | <0.02    | <0.02      |   | Verifica      |   |
|   | ×     | 면     | 7        | Pd       | õ         | \$       | Z          |   | tion          |   |
|   | 40.2  | 40.02 | <0.02    | 40.02    | <0.02     | <0.02    | <0.02      |   | by ICP-N      |   |
|   | જ     | Sm    | Ru       | RЬ       | 25        | R        | 77         |   | n) Sh         |   |
|   | <0.02 | <0.02 | <0.02    | <0.02    | <0.02     | <0.02    | <0.02      |   | g/mL)         |   |
|   | Ta    | rs.   | Sr       | Na       | βA        | ī.       | Se         |   |               | l |
|   | <0.02 | 40.02 | <0.02    | <0.2     | <0.02     | <0.02    | 40.2       |   |               |   |
|   | Ti    | Sn    | Im       | Th       | Ħ         | Te       | σľ.        |   |               |   |
|   | <0.02 | 40.02 | 0.02     | 40.02    | 40.02     | 40.02    | <0.02      |   |               |   |
|   | Zr    | 2     | ×        | ₩        | <         | c        | ¥          |   |               |   |
|   | <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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## Certified Reference Material CRM



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

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

24002546 Nitric Acid

2.0% 

Nominal Concentration (µg/mL):

NIST Test Number:

BTU<sub>9</sub> 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

**Expiration Date:** 

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

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





800-368-1131



## Certified Reference Material CRM

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

|    |               |    |                |                     |              |             | Trace M      | etals       | Verificat      | cation        | by ICP-M      | (J) S  | ua/mL)       |    |       |    |       |   |              |
|----|---------------|----|----------------|---------------------|--------------|-------------|--------------|-------------|----------------|---------------|---------------|--|--------------|----|-------|----|-------|---|--------------|
|    | TATES AND AND |    | District Color | STATE OF THE PERSON |              | Section and |              | SOMETHINGS. | NAME OF STREET | SAMOOGE STATE | SECOND SPINSO | No. of Concession, Name of Street, or other Persons and Street, or other P | . 18         |    |       |    |       |   |              |
| F  | <0.02         | 3  | <0.02          | Ďλ                  | <0.02        | HL          | <0.02        | Li          | <0.02          | z             | <0.02         | Ā  | <0.02        | Se | <0.2  | T. | <0.02 | M | <0.02        |
| Sp | <0.02         | ථ  | <b>40.2</b>    | 占                   | ₹0.02        | He          | <0.02        | 3           | <0.02          | £             | <0.02         | Re   | <0.02        | Š  | <0.02 | ę  | ₹0.02 | Þ | <0.02        |
| As | <0.7          | ඊ  | <0.02          | 립                   | <b>₩</b>     | ដ           | <b>€0.02</b> | Mg          | 10.0>          | ő             | <0.02         | Rh   | <0.02        | Ag | <0.02 | F  | <0.02 | > | <b>40.02</b> |
| Ba | <0.02         | ర  | <0.02          | 3                   | <0.02        | ㅂ           | <0.02        | Mn          | <0.02          | 2             | <0.02         | 8  | <0.02        | ž  | 40.2  | Ħ  | <0.02 | 2 | <0.02        |
| æ  | Т             | ర  | <b>40.02</b>   | ő                   | <b>40.02</b> | £           | <0.7         | Hg          | <02            | Δ,            | <0.02         | Ru   | <0.02        | š  | <0.02 | Tm | ₹0.02 | × | <b>40.02</b> |
| 洒  | <0.02         | රි | <0.02          | ප                   | <0.02        | ឌ           | <b>40.02</b> | Mo          | <0.02          | 武             | 40.02         | Sm   | <0.02        | S  | <0.02 | S  | <0.02 | 2 | <0.02        |
| æ  | <0.02         | ರೆ | <0.02          | Au                  | <0.02        | £           | ₹0.02        | PK          | <0.02          | M             | <0.2          | S  | <b>40.02</b> | Ta | <0.02 | F  | <0.02 | Z | <b>40.02</b> |

(T) = Target analyte

## Physical Characterization:

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

### Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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

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

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

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

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

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

Part # 57050



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

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

|                     |   | Г         |
|---------------------|---|-----------|
|                     | B B B B B B B B B B B B B B B B B B B                       | ı         |
|                     | 4000<br>4000<br>4000<br>4000<br>4000<br>4000<br>4000<br>400 |           |
|                     | 585555  |           |
|                     | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   |           |
|                     | Dy<br>C C E E E<br>Ar                                       |           |
|                     | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02          |           |
|                     | ## ##<br>## ## ##   |           |
|                     | 4000<br>4000<br>4000<br>4000<br>4000<br>4000                | Trace N   |
|                     | Mo Mn Li  | etal      |
| (T) = Tamet analyte | 4002<br>4002<br>4002<br>4002                                | s Verific |
| met en              | K P P P S N N   | ation     |
| shoto               | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   | by CP-    |
|                     | S R R R R R   | SN        |
|                     | 4000<br>4000<br>4000<br>4000<br>4000                        |           |
|                     | S IS & S S E  |           |
|                     | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                   |           |
|                     | はなばははは  |           |
|                     | 4002<br>4002<br>4002<br>4002                                |           |
|                     | * > > \$ × 2 ×  |           |
|                     | 600<br>600<br>600<br>600<br>600                             |           |

(I) = larget analyte

## Physical Characterization:

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

Certified by:

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

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\* 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: 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  |      |
|   |        |        |            |           |                |  | 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 46 | Cau. Co   | CHARLE WO      | [1] Specifical No.1 Cat. 04.04% pool: nacotation of the partition of the p |               |  |              |            |   |  |      |

| 1.056 | 5.0E5 | m/z->      | 5.0E7 | 1.0E8 | 5.067 |
|-------|-------|------------|-------|-------|-------|
|       |       |            |       | -     |       |
|       |       | .0         |       | 0     |       |
|       |       | O          |       | 120   |       |
|       |       | .O         |       | 130   |       |
|       |       | .0         |       | 041   |       |
|       |       | .09        |       | 150   |       |
|       |       | . <b>O</b> |       | 100   |       |
|       |       |            |       | 170   |       |
|       |       | 202        |       |       |       |
|       |       | 80         |       | 160   |       |
|       |       | 00         |       | 08    |       |
|       |       | 001        |       | 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)          |                                      |                     |                |       |                     |                 |
|----|--------------|----|---------------|----|----------------|----|--|------------------|---|--------|---------------|---------|-----------------|--------------------------------------|---------------------|----------------|-------|---------------------|-----------------|
| 1  |              |    |               |    |                |    | STREET, STREET | No section lives | ALL DESCRIPTION OF THE PERSON | 10.000 | Market Mark   | MINNSH. | San Salar Salar | Name and Address of the Owner, where | Service of the last | SECOND STATES  |       | THE PERSON NAMED IN | STREET, SQUARE, |
| IV | <0.02        | ಶ  | 1             | Š  | 40.02 Dy 40.02 | Ħ  | <0.02  | П                | <0.02   | Z      | <0.02         | Æ       | <0.02           | æ                                    | <0.2                | £              | <0.02 | A                   | <0.02           |
| ౙ  | <b>40.02</b> | రే | <b>40</b> 7   | 占  | <0.02          | H9 | <0.02  | .3               | ₹005  | Ź      | ₹0.02         | 2       | <0.02           | Š                                    | 40.02               | T <sub>e</sub> | 40.05 | ם                   | 40.02           |
| As | <b>Q</b> 5   | ප  | 40.02         | 呂  | <b>40.02</b>   | ų  | <0.02  | Mg               | 10.05   | ő      | ₹0.02         | 됩       | <0.02           | Ag                                   | <b>40.02</b>        | F              | <0.02 | >                   | Ø.02            |
| 쯃  | <b>40.02</b> | చ  | <b>40.02</b>  | 3  | <b>4002</b>    | ㅂ  | <0.02  | Ma               | <0.02   | 콘      | ₹000          | 2       | <b>40.02</b>    | Na                                   | 40.2                | Ę              | 20:0> | Ŗ                   | Ø.02            |
| 2  | ¥0.01        | ඊ  | <b>20.0</b> 2 | පී | <b>40.02</b>   | હ  | 40.2   | 쁀                | \$ 20   | تم     | ₹0.02         | 콥       | 40.02           | Ş                                    | <b>40.02</b>        | Tm             | Ø.02  | 7                   | Ø.02            |
| 遥  | <b>40.02</b> | රි | ۳             | Ğ, | <b>4002</b>    | ដ  | <0.02  | Mo               | <b>40.02</b>  | Æ      | <b>20'0</b> > | S       | <0.02           | S                                    | <b>40.02</b>        | Sn             | 40.02 | Zn                  | Ø.02            |
| æ  | <0.02        | ට් | <0.02         | Αn | <0.02          | 윤  | Z0'0>  | P                | <0.02   | м      | 40.2          | S       | <0.02           | E.                                   | <b>40,02</b>        | Ħ              | Ø.02  | 72                  | Ø.02            |

(T)= Target analyte

## Physical Characterization:

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



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



Lot # 091923

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

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

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### 02/00/24 Certified Reference Material CRM

W 580



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

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: NIST Test Number: Expiration Date: Part Number: Description: Lot Number: 57033 111323 Arsenic (As) **BTUB** 1000 111326 Ambient (20 °C) 5E-05 Balance Uncertainty 24002546 Lot# 2.0% Nitric Acid Solvent: 80.0 Nitric Acid Formulated By: Reviewed By: Therence Pedro L. Rentas Lawrence Barry

1. Arsenic (As)

58133

020522

0.1000

400.0

0.084

1000

10001.0

1000.0

2.0

7440-38-2

0.5 mg/m3

orl-rat 500 mg/kg 3103a

Number Part

Number Lot

Vol. (mL)

Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/ml.) Uncertainty Expanded

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

LD50

NIST SRM

SDS Information

111323

111323

Dilution Factor

initial

Uncertainty

Nominal

Initial

Final

Compound

Volume shown below was diluted to (mL):

4000.0

0.06

Flask Uncertainty

| m/z->   | 500 | 1000   | N<br>is<br>m<br>4 | m/z-y<br>5.0E4 | 1.025 | 2.0E5                                   |
|---------|-----|--|-------------------|----------------|-------|---|
|         |     |  |                   |                |       | 3                                       |
| N 0     |     | 110  |                   | ō              |       | [] Speatrum No.1                        |
|         |     |  |                   |                |       | Z<br>0.1                                |
| 000     |     | 200  |                   | N.             |       | ő                                       |
| 230     |     | 130  |                   | 30             |       | [ 34.433 sec]:57033.D# [Count] [Linear] |
|         |     | The state of the s |                   | er gere        |       | 90]:570                                 |
| N<br>40 |     | 140  |                   | ò              |       | )33.D#                                  |
| N<br>0  |     | -d-1   |                   | 50             |       | [Count]                                 |
| Ö       |     | Ö  |                   | 0              |       | Lines                                   |
| N<br>O  |     | 160  |                   | 0              |       | 5                                       |
|         |     |  |                   |                |       |   |
|         |     | 170  |                   | 70             |       |   |
|         |     | 180  |                   | 80             |       |   |
|         |     | 0  |                   |                |       |   |
|         |     | 190  |                   | 90             |       |   |
|         |     | A1   | -                 |                |       |   |
|         |     | NOO  |                   | 100            |       |   |

Part # 57033

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

|                | - H H H > /0 >  | 8        | - |
|----------------|---|----------|---|
|                | AS Sb Ba Bi Bi  |          |   |
|                | 4002<br>4002<br>4002<br>4002<br>4002                              |          |   |
|                | 5 8 ជ ង 8 ជ ប   |          |   |
|                | 402<br>402<br>402<br>402<br>402<br>402                            |          |   |
|                | <b>₹</b> ७८८ = = ⊅  |          |   |
|                | 6000<br>6000<br>6000<br>6000<br>6000<br>6000<br>6000<br>600       |          |   |
|                | 322428  |          |   |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                         | Trace N  |   |
|                | N H M L L   | letals   |   |
| 9              | 40.2<br>40.2<br>40.2<br>40.2<br>40.2                              | Verifica |   |
| = Target       | M P P B S K N   | 를<br>이   |   |
| Target analyte | 40.02<br>40.02<br>40.02<br>40.02                                  | by ICP-N |   |
|                | S R R R R   | AS (m    |   |
| R              | 4444<br>444<br>444<br>444<br>444<br>444<br>444<br>444<br>444<br>4 | g/mL)    |   |
|                | Ta Sr Na Sc   |          |   |
|                | 40.2<br>40.2<br>40.2<br>40.2<br>40.2<br>40.2                      |          |   |
|                | ######################################                            |          |   |
| (e)            | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02                |          |   |
|                | Z Z Y Z < C &   |          |   |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                         |          |   |

## Physical Characterization:

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

Certified by:



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

Part # 57033

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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

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

|                 | Γ              |              |                | , ,-          | , s           |              | , .          | 1                 | Г        |     |
|-----------------|----------------|--------------|----------------|---------------|---------------|--------------|--------------|-------------------|----------|-----|
|                 | F              | 3 <u>5</u>   | i Re           | , 00          | AS            | 90           | # ≥          | 1                 |          |     |
|                 | 20.02          | 20.02        | 10.0           | <b>40.02</b>  | 20.2          | 20.02        | 40.02        |                   |          |     |
|                 | 2              | . S          | ť              | ဂ္ဂ           | £             | . E          | S            |                   |          |     |
|                 | 40,02          | A0.02        | A),02          | 0.02          | <b>6</b> 0.02 | 40.2         | <b>40.02</b> | CHANGE CONTRACTOR |          |     |
|                 | Au             | ွင့          | င္အ            | S.            | 먑             | Ē            | Dy           |                   |          |     |
|                 | A0.02          | A.02         | 40.02          | 40,02         | 40.02         | 40.02        | <b>40.02</b> | WHITE STREET      |          |     |
|                 | 3              | 5            | 냚              | 뱌             | ᆑ             | Ħ            | H            | I                 | 1        |     |
|                 | 40.02          | 40,02        | 402            | 40,02         | 40.02         | <b>40.02</b> | 40.02        |                   | race Me  |     |
|                 | Z              | Mo           | Hg             | Mn            | Mg            | Lu           | Ľ            |                   | letals   |     |
| Townst analytic | <b>40.02</b>   | A),02        | 402            | 40.02         | ₩0.01         | <b>40.02</b> | <0.02        |                   | Verifica |     |
|                 | ~              | ጀ            | ۳              | æ             | Ŝ             | ₹            | Z            | į                 | tion     |     |
|                 | Ą              | <b>40,02</b> | 7              | 0.02          | <0.02         | 40.02        | 40,02        |                   | by ICP-N |     |
|                 | Sc             | Sm           | R <sub>L</sub> | R.            | æ             | æ            | 27           |                   | E SI     |     |
|                 | 40.02          | 40.02        | 40.02          | 40.02         | <b>∆</b> 0.02 | A<br>02      | 40.02        | ļ                 | g/mL)    | 100 |
|                 | T <sub>B</sub> | S            | Ş              | Z             | ≱             | S            | &            |                   |          |     |
|                 | 40.02          | <b>∆</b> .02 | <b>6.02</b>    | <b>6</b> 02   | <b>∆</b> 0,02 | 40.02        | 40.2         |                   |          |     |
|                 | 17             | Sh           | T              | Ħ             | Ħ             | Te           | 4L           |                   |          |     |
|                 | <0.02          | <0.02        | <0.02          | <b>∆</b> 0.02 | 40.02         | 40,02        | 40,02        | THOUSAND THE      |          |     |
|                 | Zr             | Zn           | Υ.             | <b>¥</b>      | <             | Ϥ            | W            |                   |          |     |
|                 | <0.02          | <b>6002</b>  | A).02          | A0.02         | & .02<br>.03  | A0.02        | 40.02        |                   |          |     |

(I)= larget analyte

## Physical Characterization:

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

Certified by:

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

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

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

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

2 of 2

Part # 57115

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

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

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

Part # 57016

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

(I) = larget analyte

## **Physical Characterization:**

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

Certified by:

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

the preparation of all standards.

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

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

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

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

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

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Certified Reference Material CRM

109/24

M5817

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 071123 57116

Solvent:

071123

**ASTM Type 1 Water** 

Burense

Formulated By:

Lawrence Barry

071123

Lot #

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

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

Recommended Storage:

EU1B

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

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

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

Expanded

071123

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

| m/z->       | 1.005 | m/z-><br>2.0E5 | 2.565 | 5.0E5 | 1000 | 2000 |
|-------------|-------|----------------|-------|-------|------|------|
|             |       |                |       | ė     |      |      |
| 0           |       | 110            |       | 10    |      |      |
| N<br>N<br>O |       | 120            |       | P.O   |      |      |
| 230         |       | 130            |       | 30    |      |      |
| 240         |       | 14.0           |       | 40    |      |      |
| 250         |       | 150            |       | 50    |      |      |
| 260         |       | 190            |       | 8     |      |      |
|             |       | 170            |       | 70    |      |      |
|             |       | 180            |       | 8     |      |      |
|             |       | 190            |       | 90    |      |      |
|             |       | 200            |       | 100   |      |      |

Part # 57116

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

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

Physical Characterization:

(1)= larger analyte

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

Certified by:

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

Part # 57116

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Certified Reference Material CRM

109/24

Solvent: 24002546 Nitric Acid

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

CERTIFIED WEIGHT REPORT: M.5818

Part Number: Lot Number: Description: 57014 122023 Silicon (SI)

**Expiration Date:** 122026

2%

Nitric Acid

Formulated By:

Aleah O'Brady

122023

Areah o Brash

Reviewed By:

Pedro L. Rentas

122023

SRM

<u>E</u> 40.0

Nominal Concentration (µg/mL): Recommended Storage: NIST Test Number: 6UTB 1000 Ambient (20 °C)

Weight shown below was diluted to (mL): 1999.48 5E-05 Balance Uncertainty

0.058 Flask Uncertainty

|   | 11 -  |
|---|---|
| Ammonium hexafluorosilicate (Si)                        | Compound  |
| 10009 :   | RM#   |
| SID082022A1   | Lot   |
| IN009 SID082022A1 1000 99.999 0.10 14.4 13.8854 13.8855 | Lot Nominal Purity Uncertainty Assay Number Conc. (µg/mL) (%) Purity (%) (%) W  |
| 99.999  | Purity<br>(%)   |
| 0.10  | Uncertainty Purity (%)  |
| 14.4  | Assay<br>(%)  |
| 13.8854   | Target<br>Weight (g)  |
| 13.8855   | Actual<br>Weight (g)  |
| 1000.0  | Actual<br>Conc. (µg/mL)   |
| 2.0   | Expanded Uncertainty +/- (µg/mL)  |
| 16919-19-0  | (Solven   |
| 1000.0 2.0 16919-19-0 2.5 mg/m3                         | Expanded  Actual Uncertainty (Solvent Safety Info. On Attached pg.)  Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 |
| orl-mus 70 mg/kg  | on<br>Attached pg.)   |

| m/z-> | 5.0E5 | m/z->    | 1.026 | m/z->      | 2500 | \$1<br>0<br>0                         |
|-------|-------|----------|-------|------------|------|---------------------------------------|
|       |       |          |       |            |      | E 8                                   |
| 210   |       | 0        |       | <b>1</b>   |      | [1] Spectrum No.1                     |
|       |       |          |       |            |      | 3<br>2<br>0.1                         |
| 220   |       | 20       |       | N.         |      | -                                     |
| N     |       |          |       |            |      | 31.393                                |
| 230   |       | 130      |       | G of .     |      | 8ec]:                                 |
| 240   |       | 4.0      |       | 4          |      | 31.393 sec]:58014.D# [Count] [Linear] |
| 0     |       | 0:       |       | :          |      | (C)                                   |
| 250   |       | 150      |       | Ø.         |      |                                       |
|       |       |          |       |            |      | inear]                                |
| 200   |       | 160      |       | <b>0</b> . |      |                                       |
|       |       |          |       | .d.<br>.d. |      |                                       |
|       |       | 170      |       | 70         |      |                                       |
|       |       | , d      |       | 0          |      |                                       |
|       |       | 80       |       | 80         |      |                                       |
|       |       | 19.<br>O |       | 0          |      |                                       |
|       |       |          |       |            |      |                                       |
|       |       | NOO      |       | 100        |      |                                       |
|       |       |          |       |            |      |                                       |

Part # 57014

Lot # 122023



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

| Ţ.               | <b>5</b> | B            | ķ           | 7 5   | # :    | As       | 30                                      | 2     | A            | i  | Ī        |    |
|------------------|----------|--------------|-------------|-------|--------|----------|---|-------|--------------|--|----------|----|
| ŀ                | _        | _            | _           |       |        | _        |   | _     | 1            |  |          |    |
| 70.02            | 3        | <u> 0</u> 02 | 10.05       | 20.02 | 3 1    | 8        | 20.02                                   |       | 40.02        | The state of the s |          |    |
| 2                | ?        | င            | 7           | , Ç   | 3 8    | <u>ئ</u> | S.                                      | 1     | 2            |  |          |    |
| \$0.02           | 3        | A).02        | <0.02       | 20:02 | 3 6    | 3        | 40.2                                    | 40.04 | 20.02        | 住地に なる 日本の   |          |    |
| A                |          | ಕ್ಕ<br>ಕ     | G           | ğ     | 2 5    | न<br>इ   | Ē,                                      | 5     | 7            | 2000 mg/mg/  |          |    |
| 20.02            |          | A) (2)       | A)22        | 40.52 | 60.02  | 3        | 40.02                                   | 20.02 | 000          |  |          |    |
| Ğ                | ! }      |              | <b>'</b>    | H     | ۱ ا    | 7        | 픙                                       | 111   | AB.          |  |          | ٠  |
| 40.02            | 40.0     | 3            | <b>60.2</b> | 40.02 | 20.02  | 3        | <b>∆</b> .02                            | 20.02 | 000          | SOMEON PROPERTY.   | Hace M   | ,  |
| Nd               | 10.00    | 5            | 8H          | Mn    | . 00   | <u> </u> | Ē                                       | E     | 1            |  | verais   |    |
| <0.02            | 10.07    | 3            | <b>6</b> 02 | 40,02 | 10.03  | 2        | <b>∆</b> 0,02                           | 20.02 |              |  | Verifica | 11 |
| ×                | 2        | Ş            | ٦           | Pd    | ç      | ,        | \$                                      | 2     | 1            |  | HOD      |    |
| 40.2             | 20.02    | 3            | ∆.02        | 40,02 | 40.02  |          | 8.00                                    | 20.02 |              | ŀ  | by ICP-I |    |
| જ                | 300      | 2            | ₽           | R     | 2      | !        | <b>7</b>                                | 7     |              | ļ  | E S      |    |
| 40.02            | 20.02    | 3            | 40.02       | 20.0≥ | 40.02  |          | 8                                       | <0.02 |              | ľ  | g/mL)    |    |
| Ta               | v        | ,            | S.          | Z     | A<br>A |          | 2                                       | Se    |              |  |          | I  |
| <b>&amp;</b> .02 | 20.02    | 3            | 83.6        | 40.2  | 40.02  |          | -1                                      | 40.2  |              | -  |          |    |
| Ħ                | Sn       | ,            | ď           | Ħ     | Ħ      | ,        | 7                                       | 7     |              |  |          |    |
| 40.02            | 20.02    |              | 20.02       | 40.02 | 40,02  | 20.02    | 3                                       | 40.02 |              | The Real Property lies   |          |    |
| Z                | 70       | ,            | <u> </u>    | \$    | <      | •        | ======================================= | ¥     |              |  |          |    |
| <b>∆</b> 0.02    | 40.02    | 1010         | <b>A</b>    | 40.02 | 40.02  | 10.02    | 3                                       | 40.02 | O) SOUTHWOOD |  |          |    |

(T) = Target analyte

## **Physical Characterization:**

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

Certified by:

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

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

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

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

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Certified Reference Material CRM

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ング

Solvent: 24002546

Nitric Acid

F Lot #

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: 58030

Description:

111623 Zinc (Zn)

Ambient (20 °C) 111626

**Expiration Date:** 

Nominal Concentration (µg/mL): Recommended Storage:

**NIST Test Number:** 

**BTU9** 1000

5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Weight shown below was diluted to (mL):

3000.4

5

Nominal

Purity

Uncertainty Assay

Target

Actual

Actual

Uncertainty

Expanded

<u>%</u> 60.0 <u>a</u>

Nitric Acid

Formulated By: Benson Chan

111623

Reviewed By: Pedro L. Rentas

111623

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



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

200

100

Part # 58030

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

|                | BE BE S S A  | Г        |  |
|----------------|--|----------|--|
|                | 4002<br>4002<br>4002<br>4001<br>4002<br>4002       |          |  |
|                | 585855   |          |  |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02          |          |  |
|                | 26 G G E E D                                       |          |  |
|                | 000000000000000000000000000000000000000            |          |  |
|                | 田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田田            |          |  |
|                | 40.00<br>40.00<br>40.00<br>40.00<br>40.00<br>40.00 | Trace Me |  |
|                | Mo Mg LL   | letals   |  |
| Threat and the | 40.02<br>40.02<br>40.02<br>40.02<br>40.02          | Verifica |  |
|                | X Y T R Q S Y X                                    | tion     |  |
|                | 40.22<br>40.22<br>40.22<br>40.22                   | by ICP-  |  |
|                | S E E E E F  | Š        |  |
|                | 66666666666666666666666666666666666666             | (ug/mL)  |  |
|                | Ta Sr Za Ag  |          |  |
|                | 402<br>402<br>402<br>402<br>402                    |          |  |
|                |  | 1        |  |
|                | 00000000000000000000000000000000000000             |          |  |
| 100            | 22×2<=   |          |  |
|                | \$ 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8           |          |  |

(I) = larget analyte

## Physical Characterization:

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

Certified by:

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

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<sup>\*</sup> All standard containers are meticulously cleaned prior to use.
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Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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

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

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## Certified Reference Material CRM

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CERTIFIED WEIGHT REPORT: Lot #

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

Formulated By:

Lawrence Barry

091123

Pedro L. Rentas

091123

**SDS** information

rento

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

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

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

Part # 57015

--z/m

210

220

230

240

250

260



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

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

|                | ľ            | В             | <u> </u> | Ħ.               | 뮸             | 200           | Ę,            | 3            |                | ş                                       | 2            | 4              |          |          |
|----------------|--------------|---------------|----------|------------------|---------------|---------------|---------------|--------------|----------------|---|--------------|----------------|----------|----------|
|                |              | A 022         | 20.02    | 3                | -<br>60<br>10 | 70.02         | 3             | 70           |                | <b>A</b>                                | 2002         | 200            |          |          |
| ř.             |              | <u>ნ</u>      | 8        | ,                | <u></u>       | Ç             | ?             | g            |                | ვ.<br>                                  | 2            | 2              |          |          |
|                |              | A<br>23<br>23 | 20705    | 3                | A<br>20.02    | 20.02         | 3             | 40.02        |                | 2                                       | 20,02        | 3              |          |          |
|                |              | A II          | Ę        | 1                | ට<br>ව        | 2             | 2             | 달            | Ž              | Į,                                      | Ų            |                |          |          |
|                |              | 3             | 40.02    |                  | 3             | <b>♦0.02</b>  | )             | 8            | 20.02          | 3                                       | <b>∆</b> .02 |                |          |          |
|                |              | ÿ             | <u>_</u> |                  | ₹1            | 4             |               | <u> </u>     | 0.0            | F .                                     | H            | 1              |          |          |
|                | 2000         | 3             | <u> </u> | 4.4              | 3             | <b>∆</b> 02   |               | <b>6</b> 002 | 20.02          | 3                                       | 40.02        | -              |          | Trace M  |
|                | 1            | ž             | š        | 200              | Ç             | ¥             | 9             | <b>X</b>     | Į,             | •                                       | 5            |                |          | <u>P</u> |
| 3              | 20,02        | 3             | <u>8</u> | 202              | 3             | <b>∆</b> 0,02 | 1000          | <u>^</u>     | 40,02          | 2                                       | A 0,02       |                |          | Verifica |
| Target         | ŀ            | 4             | 7        | 7                | ,             | Z             | Ş             | Ş            | S              |   | Z            |                |          | †:<br>   |
| Target analyte | ê            | 9             | A)       | _                |               | 8             | 10:04         | 3            | A0.02          |   | A) (2)       |                | 3        | אי וכפרו |
|                | Se.          | •             | S        | ¥.               | ,             | <del>루</del>  | 2             | <b>P</b>     | ₽              | :                                       | Ŗ            | Manager Street | F        | 100      |
|                | 40.02        |               | A<br>S   | 40.02            |               | A             | 70.05         | 3            | <u>\$</u> 0.02 | *************************************** | A            |                | g/ IIIL) | 7        |
|                | Ta           | ,             | ^        | ş                |               | Z.            | A             | •            | S              | ş                                       | ß            | SANSON COM     |          |          |
|                | 40.02        | 70.02         | 3        | <b>∆</b> 0,02    | Į.            | 3             | 20,02         | 3            | <b>∆</b>       | ć                                       | 3            |                |          |          |
|                | 111          | ě             | ?        | Ĭ'n              | Ē             | <b>;</b>      | Η             | !            | 7              | č                                       |              |                |          |          |
|                | <b>40.02</b> | 70.02         | 3        | <b>∆0,02</b>     | 2000          | 3             | <b>∆</b> 0.02 | 2            | 200            | 20.02                                   | 300          |                |          |          |
|                | Zr           | 2             | 7        | <u>~</u>         | 16            | \$            | \<br>-        |              | 9              | *                                       |              |                |          |          |
|                | 40.02        | 20.02         | 3        | \$00<br>200<br>- | 70.0>         | 3             | <u>6</u> 0.02 |              | A) (2)         | 20.02                                   |              |                |          |          |

## Physical Characterization:

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

Certified by:

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

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

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



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

Part # 57028

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

|    |         |      |   |       |    |       |     | Ггасе Ме | tals | Verifica           | tion | by ICP-I | Sh<br>( | 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:

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

<sup>\*</sup> All standard containers are meticulously cleaned prior to use.

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

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

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

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

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->  | 1.0E8 | m/z-> | 1.0E8 | m/z-> | 1.0≣4 | 2.064                                 | 1. Selenium (Se)   | Compound  | Volume sho                              | Nominal Concentration (µg/mL): | Expiration Date:          | D              | Pa                          | CERTIFIED WEIGHT REPORT: |
|--------|-------|-------|-------|-------|-------|---------------------------------------|--------------------|---|---|--------------------------------|---------------------------|----------------|-----------------------------|--------------------------|
| 210    |       | 110   |       | 10    |       | [1] Speatrum No.1                     | 58                 | Nui P   | Volume shown below was diluted to (mL): | centration (µg/mL):            | Expiration Date:          | Description:   | Part Number:<br>Lot Number: | RT.                      |
| 220    |       | 120   |       | 20    |       |                                       | 58134 071223       | Part Lot<br>Number Number   | diluted to (mL):                        | 1000                           | 060627<br>Ambient (20 °C) | Selenium (Se)  | 57034<br>060624             |                          |
| 230    |       | 130   |       | 30    |       | 33.702 se                             | 0.1000             | Dilution  | 2000.07                                 |                                | 6<br>C)                   | (Se)           |                             |                          |
| 240    |       | 140   |       | 40    |       | c]:58034.D                            | 200.0 0.084        | Initial Uncertainty<br>Vol. (mL) Pipette (mL)                                   | 0.100 Flask Uncertainty                 |                                |                           |                |                             |                          |
| 250    |       | 150   |       | 50    |       | 33.702 sec]:58034.D# [Count] [Linear] | 4 1000             | Initial Uncertainty Nominal Vol. (mL) Pipette (mL) Conc. (µg/mL)                | Flask Uncertainty                       |                                |                           | 2.0%           | 24002546                    | Lot#                     |
| N 00 0 |       | 160   |       | 60    |       | Linear]                               | 10002.5            |   |   |                                | (mL)                      | 40.0           | Nitric Acid                 | Solvent:                 |
| J      |       | 170   |       | 70    |       |                                       | 1000.0             | Initial Final Conc. (µg/mL) Conc. (µg/mL)                                       |   |                                |                           | Nitric Acid    |                             | , ,                      |
|        |       |       |       | 80    |       |                                       | 2.2                | Expanded Uncertainty +/- (µg/mL)  | neviewed by.                            | 1 1 1                          |                           | Formulated By: |                             | 104                      |
|        |       | 180   |       |       |       |                                       | 7782-49-2          | (Solvent S  |   | in Re                          |                           |                |                             |                          |
|        |       | 190   |       | 90    |       |                                       | 0.2 mg/m3          | SDS Information Safety Info. On Atta OSHA PEL (TWA)                             | redio L. nellias                        |                                |                           | Benson Chan    | 1, 1                        |                          |
|        |       | NOO   |       | 100   |       |                                       | orl-rat 6700 mg/kg | SDS Information (Solvent Safety Info. On Attached pg.)  AS# OSHA PEL (TWA) LD50 | 000524                                  | ,                              |                           | 060624         |                             |                          |
|        |       |       |       |       |       |                                       | 3149               | NIST  | <u>L</u>                                | <u> </u>                       |                           |                |                             |                          |

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

| Г  |       |     |       |    |       |    | Trace M | etals | Verifica | tion | by ICP-M | S (µ | g/mL) |    |       |    |       |    |       |
|----|-------|-----|-------|----|-------|----|---------|-------|----------|------|----------|------|-------|----|-------|----|-------|----|-------|
| ≥  | <0.02 | СЧ  | <0.02 | Dy | <0.02 | Hf | <0.02   | E.    | <0.02    | Ä    | <0.02    | Pr   | <0.02 | Se | H     | Тъ | 40,02 | w  | <0.02 |
| Sb | <0.02 | က္  | <0.2  | 耳  | <0.02 | Ho | <0.02   | Ę     | <0.02    | ¥    | <0.02    | Re   | 40.02 | S: | <0.02 | Te | <0.02 | U  | <0.02 |
| As | <0.2  | ೮   | <0.02 | 臣  | <0.02 | Ħ  | <0.02   | Mg    | <0.01    | 0°   | <0.02    | 라    | 40.02 | Ag | <0.02 | ∄  | 40.02 | ۷  | <0.02 |
| Ва | <0.02 | Cs  | <0.02 | 2  | <0.02 | ŀ  | <0.02   | Mn    | <0.02    | Pd   | <0.02    | ₽    | 40.02 | Ŋ  | <0.2  | Ħ  | <0.02 | ታ  | <0.02 |
| Ве | 40.01 | ť   | 40.02 | Ga | <0.02 | Fe | <0.2    | Hg    | 02       | P    | <0.02    | Ru   | 40.02 | Sr | <0.02 | Tm | <0.02 | ¥  | <0.02 |
| В. | 40.02 | င္ပ | <0.02 | G  | <0.02 | Ľ  | <0.02   | Mo    | <0.02    | 7    | <0.02    | Sm   | 40.02 | S  | <0.02 | Sn | 40.02 | Zn | <0.02 |
| Б  | <0.02 | Cı  | <0.02 | Au | <0.02 | 광  | <0.02   | M     | <0.02    | ×    | <0.2     | Sc   | <0.02 | Ta | <0.02 | Ħ  | <0.02 | Zr | <0.02 |

(T) = Target analyte

## Physical Characterization:

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

Certified by:

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

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

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

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

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

2 of 2



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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

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

## Characterization of CRM/RM by One Method

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

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

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

ucher a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

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

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

## 4.0 TRACEABILITY TO NIST

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

## 4.1 Thermometer Calibration

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

## 4.2 Balance Calibration

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

## 4.3 Glassware Calibration

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

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

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

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

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

## 6.0 INTENDED USE

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

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

## 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

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

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

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

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

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

## 8.0 HAZARDOUS INFORMATION

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

## 9.0 HOMOGENEITY

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

## 10.0 QUALITY STANDARD DOCUMENTATION

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

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

## 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

## 11.1 Certification Issue Date

July 17, 2022

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

## 11.2 Lot Expiration Date

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

## 11.3 Period of Validity

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

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

Uyen Truong Supervisor, Product Documentation

Meyer Trusing

## **Certificate Approved By:**

Michael Booth Director, Technical Michael 2 Booth

## **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director Paul R Saine

## Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



## ACCREDITATION / REGISTRATION

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

## PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

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

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

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

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

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

Assay Information:

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

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

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

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

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

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

4.0 TRACEABILITY TO NIST

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

## 4.2 Balance Calibration

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

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

CRM/RMs are tested for trace metallic impurities by Axial ICP-DES and ICP-MS. The result from the most sensitive method for each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of ore each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of the properties of the properties

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

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

Page 2 of 4

INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

> uR M 882000.0

> 9A M 886 0.000.0

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

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

> iN O 882000.0 > 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 Columbiant of the contract of the Columbiant of the Colu

## HOMOGENEITY

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

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

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

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

1:1:1 H2O / HF./ H2SO4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite Volentily), Oxide - Northere are repetation; and sociation; restore (Dissolved by heating in 1737 HZO / HF / HZSO4); Oxide - Northere history (~800EC) brooklie (fuse in Pt0 with KZSZO7); Ores (fuse in Pt0 with KZZZO7); Ores (fuse in Pt0 with provide it as plastic pigment and likely in brooktie (fuse in Pt0 with provide it as plastic pigment and likely in brooktie TI Containing Samples (Preparation and Solution) - Metal (Soluble in 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  $4^{\circ}$  -  $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the renorded density. Do not 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  $4^{\circ}$  - 30° C while in sealed TCT bag.

Page 4 of 4

Chairman / Senior Technical Director

- Sealed TCT Bag Open Date:

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

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

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

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

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

Thomas Kozikowski Manager, Quality Control Certificate Approved By:

thibils Validity

- June 17, 2027 11.2 Lot Expiration Date

June 17, 2022 11.1 Certification Issue Date

Paul Gaines Certifying Officer:

0.Sr

0.11

CERTIFIED WEIGHT REPORT:

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



# 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 | 1 |                       |  |
|--------------------------|---|-------------------|------------------|----------------------|--------------------------------|---------------------|---|-----------------|--|--|---------------------------------------|---|-----------------------|--|
|                          | Capeate                                     | Giovanni Esposito | 2                | V                    | lord                           | Pedro L. Rentas     |   | SDS Information | (Solvent Safety Info. On Attached pg.) | OSHA PEL (TWA)   |                                       |   |                       |  |
|                          | 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<br>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<br>060724<br>Uranium (11)             |                   | 060727           | Ambient (20 °C)      | 1000                           | <b>6UTB</b>         | d to (mL):                              |                 | Lot                                    | Number   | 58192 041524                          |   |                       |  |
|                          |   |                   | **               | - 24                 | <u></u>                        | :-                  | was dilute                              |                 | Part                                   | Number   | 58192                                 |   | trum N                |  |
| CERTIFIED WEIGHT REPORT: | Part Number:<br>Lot Number:<br>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     |  |

| 1.0E6                                   | 5.0E5 | m/z-><br>5.0E4 | 2.5E4 | m/z-><br>1.0E6 | S.OES | \.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ |
|---|-------|----------------|-------|----------------|-------|--|
| [1] Spectrum No.1                       |       | 0              |       | 011            |       | C                                      |
|   |       | O              |       | 120            |       | 000                                    |
| [ 23.264 sec]:57092.D# [Count] [Linear] |       | Og             |       | 130            |       | .0                                     |
| 7092.D <b>*</b> [C                      |       | 0              |       | 140            |       |  |
| ount] [Line                             |       | 80             |       | 081            |       |  |
| ar]                                     |       | O e            |       | 160            |       |  |
|   |       | ,<br>2         |       | 170            |       |  |
|   |       | 990            |       | -@<br>-        |       |  |
|   |       | 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   | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6                    |
| ation    | Z S S B a K X  |
| Verifica | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6                    |
| etals    | N W E E  |
| Trace M  | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ |
| П        | 35.35日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日                  |
|          | 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8                    |
|          | දී පී පී පී සී සී  |
|          | 6.02<br>6.02<br>6.02<br>6.02<br>6.02<br>6.02<br>6.02     |
|          | ទី១១១១១១   |
|          | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02       |
|          | B Ba Ba  |

(T) = Target analyte

## Physical Characterization:

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





2 of 2

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

All standard containers are meticulously cleaned prior to use.

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

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

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



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

|          | THE STREET                      | <0.02 | 200   | 200   | 2 2            | 200          | 3 8          | 3 5           |
|----------|---------------------------------|-------|-------|-------|----------------|--------------|--------------|---------------|
|          | Name of the last                | W     | 1     | ->    | - <del>K</del> | · >          | Z,           | 1 2           |
|          | THE RESERVE THE PERSON NAMED IN | <0.02 | <0.02 | <0.02 | 2002           | <b>40.02</b> | 200          | 200           |
|          | DESCRIPTION OF                  | 9     | Te    | E     | É              | Į,           | 5            | Ë             |
|          | Shorty-singston                 | <0.2  | <0.02 | <0.02 | <0.2           | ļ F          | <0.02        | <b>40.0</b> 2 |
|          |                                 | Se    | Si    | Ag    | Z              | Š            | v)           | Ę             |
| (Jm/br/  |                                 | <0.02 | <0.02 | <0.02 | <0.02          | <0.02        | <0.02        | ₹0.02         |
| AS (     | SIMI                            | 놊     | Re    | 묎     | 8              | Ru           | Sm           | Š             |
| by ICP-I | Married Scin                    | <0.02 | <0.02 | <0.02 | <0.02          | <0.02        | <0.02        | 40.5          |
| ition    |                                 | ž     | ź     | ő     | 몺              | Д            | ፈ            | M             |
| Verifica | New Contraction of the          | <0.02 | <0.02 | <0.01 | <0.02          | <0.2         | <0.02        | <0.02         |
| stals    |                                 | 3     | 5     | Mg    | Mn             | Hg           | Wo           | ğ             |
| race Me  |                                 | <0.02 | <0.02 | <0.02 | <0.02          | 40.2         | <0.02        | <0.02         |
| -        |                                 | Hŧ    | Ho    | 描     | 긔              | Æ            | 2            | 윤             |
|          |                                 | <0.02 | <0.02 | <0.02 | <0.02          | ₹0.05        | <b>40.02</b> | <0.02         |
|          | - Contract                      | Ďλ    | 占     | 超     | 3              | త్           | පී           | Αn            |
|          | THE PERSON NAMED IN             | <0.02 | 40.5  | <0.02 | <0.02          | <0.02        | <0.02        | <0.02         |
|          | WE SHAME                        | ਲ     | రి    | ඊ     | ర              | ڻ            | රි           | ਹੋ            |
|          | NAME OF STREET                  | <0.02 | <0.02 | <0.2  | <0.02          | <0.01        | <0.02        | <0.02         |
|          | Market Market                   | ₹     | Sp    | As    | Ba             | æ            | B.           | В             |

(T) = Target analyte

## Physical Characterization:

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



Certified by:

Lot # 031524

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

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

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

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

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

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

Certified Reference Material CRM

# 5982 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          |     |     |            |     |     |     |
| <b>16</b>         | 5.0<br>E6                             |                   |              |   |         |         |          |                |     |     |            |     |     |     |
| 7,4%<br>1.0E      | /z-:                                  | 0                 | O<br>N       | 00                                      |         | 0       | 00       | 0              | 0.7 | •   | 0          | 0   | 00  |     |
| ú)                | 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):

|   |           |  | <b>P</b>   |       | _            | _              | _                | -            | -        | _                                       |              |              |              |
|---|-----------|--|--|-------|--------------|----------------|------------------|--------------|----------|---|--------------|--------------|--------------|
|   |           |  | N. Commission  | <0.05 | -            | <b>40.02</b>   | 200              | 70.00        | Ø.02     | 50 67                                   | 70.05        | \$0.05<br>\$ | €            |
|   |           |  |  | W     | :            | <b>&gt;</b>    | >                | -            | g<br>R   | >                                       | 1            | Zu           | 7.           |
|   |           |  | The state of the s | <0.02 | 000          | Z0'0>          | <0.02            |              | Z0:02    | CD 02                                   |              | <b>40.02</b> | 900          |
|   |           |  |  | £     | Ę            | 2              | F                | E            | -<br>-   | Ē                                       |              | E S          | ľ            |
|   |           |  |  | 97    | 200          | 70.05          | &<br>9.02        | ç            | 703      | 80.02                                   | 8            | 70'05        | <b>40.02</b> |
|   |           | ı  | Ì  | 2     | <i>57</i>    | 5              | Ag               | ź            | 2        | Š                                       | 6            | 2            | Ē            |
|   | (m)       |  | 000  | Z0.02 | <0.05        | 200            | \$0.02<br>\$0.02 | 200          | 70.05    | 9.02                                    | 200          | 70:02        | Q.02         |
|   | /6/1)     |  | ŀ  | L;    | Re           |                | ž                | Rh           | 1        | 2                                       | Ę            | 1            | Sc           |
|   | y ICP-MS  | CONTRACTOR OF THE PERSONS  | 800  | 70.00 | <b>40.02</b> | 5              | 70.05            | 20.05        |          | Q0:02                                   | 200          | 3010         | <b>€</b> 1.2 |
|   | ion b     |  | Ž  | 7     | 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     | 5            | Ma             | TA S             | Mn           | ń        | 70                                      | W            | 22           | DAI          |
|   | Trace Me  |  | <0.00  |       | <b>40.02</b> | 200            | 1000             | 20.05<br>Q   | 5        | 707                                     | Ø.02         | 2000         | 70:05        |
| l |           |  | Hf   | :     | Ho           | ٤,             |                  | <u> </u>     | Ľ        | 2                                       |              | ď            | 2            |
|   |           |  | <0.02  | 900   | 70705        | <0.02<br><0.02 |                  | <b>40.02</b> | 2002     | *************************************** | <b>40.02</b> | 2002         | W.O.         |
|   |           |  | À  | , 4   | ā            | 超              | į                | 3            | څ        | ;                                       | <b>8</b>     | Αn           |              |
|   |           | SHOOTING SALLS   | <0.02  | ç     | 70.7         | <0.02          | 6                | Z0:02        | <0.02    |   | <b>₹0.02</b> | <b>Q</b> 002 |              |
|   |           | TO SHARE   | ප  | ç     | 3            | ථ              | ć                | ڙ            | ඊ        | ,                                       | 3            | ਹੋ           |              |
|   |           | CHARLES CONTROL OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN | <0.02  | 200   | 70:00        | 97             | 200              | 70'02        | €0.01    | 000                                     | 70.05        | ₹0.05        |              |
|   |           | THE PERSON   | <b>A</b>   | £.    | 3            | As             | D.               | Pa           | <b>8</b> | ë                                       | <b>5</b>     | 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



## Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

R: 2/22/2024 M5999

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

## **ACCREDITATION / REGISTRATION** 1.0

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



## 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

CLPP-SPK-1

Lot Number:

T2-MEB721963

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

2 000 µg/mL ea:

Aluminum,

Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Manganese,

Nickel, Zinc,

Vanadium,

Cobalt,

250 µg/mL ea:

Copper,

200 µg/mL ea: Chromium,

50 µg/mL ea:

Beryllium,

Silver

## 3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

Vanadium, V

Silver, Ag

50.00 ± 0.22 µg/mL

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

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

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

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

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

 $X_i$  = mean of Assay Method i with standard uncertainty  $u_{char\ i}$ 

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

## Characterization of CRM/RM by One Method

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

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

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

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

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

k = coverage factor = 2

uchar a = the errors from characterization

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

uits = long term stability standard uncertainty (storage)
uits = transport stability standard uncertainty

## 4.0 TRACEABILITY TO NIST

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

## 4.1 Thermometer Calibration

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

## 4.2 Balance Calibration

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

## 4.3 Glassware Calibration

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

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

## 6.0 INTENDED USE

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

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

## 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

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

## 8.0 HAZARDOUS INFORMATION

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

## 9.0 HOMOGENEITY

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

## 10.0 QUALITY STANDARD DOCUMENTATION

## 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.689.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

## 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

## 11.1 Certification Issue Date

July 27, 2022

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

## 11.2 Lot Expiration Date

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

## 11.3 Period of Validity

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

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

## 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

## **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

**Paul Gaines** 

Paul R Line Chairman / Senior Technical Director

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



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

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

| m/z-> | 1.006 | 2.016 | m/z-> | N<br>O | 5.0E6 | m/z-> | 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<br>Number Co   |   | 6UTB                      | 10000                          | Ambient (20 °C)      | 011636            | Aluminum (Al)  | 011623           | )                        |
| 230   |       |       | 130   |        |       | 30    |        |       |     | 5.014 sec]:                           | 10000 99.999                      | Nominal Purity<br>Conc. (µg/mL) (%)                            | 2000.02 0.05                            | 5E-0                      |                                | <u>.</u>             |                   |                |                  |                          |
| 240   |       |       | 140   |        |       | 40    |        |       |     | 15.014 sec]:58113.D# [Count] [Linear] | 9 0.10 7.30                       | Purity Uncertainty Assay (%) Purity (%) (%)                    | 0.058 Flask Uncertainty                 | 5E-05 Balance Uncertainty |                                |                      | 2%                |                | Solvent:         | <b>&gt;</b>              |
| 250   |       |       | 150   |        |       | 50    |        |       |     | Count] [Line                          | 0 273.9779                        | ay Target<br>) Weight (g)                                      |   | <b>y</b>                  |                                | (1117)               |                   |                | it: 20510011     |                          |
| 260   |       |       | 160   |        |       | 60    |        |       |     | »ar]                                  | 274.0078 1                        | Actual<br>Weight (g) Con                                       |   |                           |                                |                      | Nitric Acid       |                | Nitric Acid      |                          |
|       |       |       | 170   |        |       | 70    |        |       |     |                                       | 10001.1 2                         | Actual Unce<br>Conc. (µg/mL) +/- (                             |   | Revi                      |                                |                      | Form              | 7              | ~e               | 7                        |
|       |       |       | 180   |        |       | 80    |        |       |     |                                       | 20.0 7784-27-2                    | Expanded (Si<br>Uncertainty (Si<br>+/- (µg/mL) CAS#            |   | Reviewed By:              | tach                           |                      | Formulated By:    | 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<br>LD50 SRM  |   | 011623                    |                                |                      | 011623            |                |                  |                          |

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

>>> Continued on page 2 >>>





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

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

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





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

Test Specification Result

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

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC





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<br>Barium, Ba | CERTIFIED VALUE<br>10.01 ± 0.04 µg/mL | ANALYTE<br>Beryllium, Be | CERTIFIED VALUE<br>10.01 ± 0.05 µg/mL |
|-----------------------|---------------------------------------|--------------------------|---------------------------------------|
| Bismuth, Bi           | 10.01 ± 0.06 μg/mL                    | Cerlum, 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                    | Lithlum, 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<sub>CRMRM</sub>, where two or more methods of characterization are used is the weighted mean of the results:

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

 $X_i$  = mean of Assay Method i with standard uncertainty  $u_{char\ i}$ 

 $\mathbf{w}_{\parallel}$  = 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 (±) =  $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ 

k = coverage factor = 2

**Certified Abundance:** 

4.0

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

## IV's Certified Abundance

| Isotope      | Atom %     |
|--------------|------------|
| Uranium 238U | 99.8 ± 0.1 |

Uranium 235U

TRACEABILITY TO NIST

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

## Characterization of CRM/RM by One Method

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

 $0.19 \pm 0.05$ 

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

 $u_{bb}^{---}$  = bottle to bottle homogeneity standard uncertainty  $u_{lts}^{--}$  = long term stability standard uncertainty (storage)

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

## 4.1 Thermometer Calibration

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

## 4.2 Balance Calibration

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

## 4.3 Glassware Calibration

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

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

N/A

## 6.0 INTENDED USE

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

  <a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

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

## 7.1 Storage and Handling Recommendations

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

| <ul> <li>Sealed TCT Bag Open Date</li> </ul> | 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

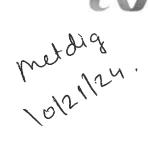
Paul R. Simo

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





M6095.



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

Revision No.: 0

### Certificate of Analysis

| Test                                      | Specification | Result      |
|---|---------------|-------------|
| ACS - Assay (as HCl) (by acid-base titrn) | 36.5 - 38.0 % | 37.6 %      |
| ACS - Color (APHA)                        | ≤ 10          | 5           |
| ACS – Residue after Ignition              | ≤ 3 ppm       | < 1 ppm     |
| ACS - Specific Gravity at 60°/60°F        | 1.185 - 1.192 | 1.192       |
| ACS - Bromide (Br)                        | ≤ 0.005 %     | < 0.005 %   |
| ACS - Extractable Organic Substances      | ≤ 5 ppm       | < 1 ppm     |
| ACS - Free Chlorine (as Cl2)              | ≤ 0.5 ppm     | < 0.5 ppm   |
| Phosphate (PO <sub>4</sub> )              | ≤ 0.05 ppm    | 0.03 ppm    |
| Sulfate (SO <sub>4</sub> )                | ≤ 0.5 ppm     | < 0.3 ppm   |
| Sulfite (SO <sub>3</sub> )                | ≤ 0.8 ppm     | 0.3 ppm     |
| Ammonium (NH <sub>4</sub> )               | ≤ 3 ppm       | < 1 ppm     |
| Trace Impurities - Arsenic (As)           | ≤ 0.010 ppm   | < 0.003 ppm |
| Trace Impurities - Aluminum (AI)          | ≤ 10.0 ppb    | < 5.0 ppb   |
| Arsenic and Antimony (as As)              | ≤ 5.0 ppb     | < 3.0 ppb   |
| Trace Impurities - Barium (Ba)            | ≤ 1.0 ppb     | < 1.0 ppb   |
| Trace Impurities - Beryllium (Be)         | ≤ 1.0 ppb     | < 1.0 ppb   |
| Trace Impurities - Bismuth (Bi)           | ≤ 10.0 ppb    | < 10.0 ppb  |
| Trace Impurities - Boron (B)              | ≤ 20.0 ppb    | 2.2 ppb     |
| Trace Impurities - Cadmium (Cd)           | ≤ 1.0 ppb     | < 1.0 ppb   |
| Trace Impurities - Calcium (Ca)           | ≤ 50.0 ppb    | 31.0 ppb    |
| Trace Impurities - Chromium (Cr)          | ≤ 1.0 ppb     | 0.5 ppb     |
| Trace Impurities - Cobalt (Co)            | ≤ 1.0 ppb     | 0.2 ppb     |
| Trace Impurities - Copper (Cu)            | ≤ 1.0 ppb     | < 0.1 ppb   |
| Trace Impurities – Gallium (Ga)           | ≤ 1.0 ppb     | < 0.2 ppb   |
| Trace Impurities - Germanium (Ge)         | ≤ 3.0 ppb     | < 2.0 ppb   |
| Trace Impurities - Gold (Au)              | ≤ 4.0 ppb     | < 0.2 ppb   |
| Heavy Metals (as Pb)                      | ≤ 100 ppb     | < 50 ppb    |
| Trace Impurities - Iron (Fe)              | ≤ 15 ppb      | 3 ppb       |
|   |               |             |

>>> Continued on page 2 >>>





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

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

Hydrochloric Acid, 36.5-38.0%

BAKER IÑŚTRA-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



Nitric Acid 69% **CMOS** 

Receive: Avantor





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

Manufactured Date: 2024-01-25 Retest Date: 2029-01-23

Revision No.: 0

### Certificate of Analysis

| Test                              | Specification | Result      |
|-----------------------------------|---------------|-------------|
| Assay (HNO <sub>3</sub> )         | 69.0 ~ 70.0 % | 69.6 %      |
| Appearance                        | Passes Test   | Passes Test |
| Color (APHA)                      | ≤ 10          | 5           |
| Residue after Ignition            | ≤ 2 ppm       | < 1 ppm     |
| Chloride (Cl)                     | ≤ 0.08 ppm    | < 0.03 ppm  |
| Phosphate (PO <sub>4</sub> )      | ≤ 0.10 ppm    | < 0.03 ppm  |
| Sulfate (SO <sub>4</sub> )        | ≤ 0.2 ppm     | < 0.2 ppm   |
| Trace Impurities - Aluminum (AI)  | ≤ 40.0 ppb    | < 1.0 ppb   |
| Arsenic and Antimony (as As)      | ≤ 5.0 ppb     | < 2.0 ppb   |
| Trace Impurities – Barium (Ba)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Beryllium (Be) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Bismuth (Bi)   | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities - Boron (B)      | ≤ 10.0 ppb    | < 5.0 ppb   |
| Trace Impurities - Cadmium (Cd)   | ≤ 50 ppb      | < 1 ppb     |
| Trace Impurities - Calcium (Ca)   | ≤ 50.0 ppb    | < 0.2 ppb   |
| Trace Impurities - Chromium (Cr)  | ≤ 30.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Cobalt (Co)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Copper (Cu)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Gallium (Ga)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Germanium (Ge) | ≤ 20 ppb      | < 10 ppb    |
| Trace Impurities - Gold (Au)      | ≤ 20 ppb      | < 5 ppb     |
| Heavy Metals (as Pb)              | ≤ 100 ppb     | < 50 ppb    |
| Trace Impurities – Iron (Fe)      | ≤ 40.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Lead (Pb)      | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities – Lithium (Li)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb      | < 1 ppb     |
| Trace Impurities - Manganese (Mn) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Nickel (Ni)    | ≤ 20.0 ppb    | < 5.0 ppb   |
|                                   |               |             |

>>> Continued on page 2 >>>





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

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

Nitric Acid 69% **CMOS** 





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

Test

Specification

Result

For Microelectronic Use

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

Sr. Manager, Quality Assurance





R -> 11/12/24

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

Manufactured Date: 2024-03-26

Retest Date: 2029-03-25

Revision No.: 0

## Certificate of Analysis

| Test                              | Specification | Result      |
|-----------------------------------|---------------|-------------|
| Assay (HNO3)                      | 69.0 – 70.0 % | 69.7 %      |
| Appearance                        | Passes Test   | Passes Test |
| Color (APHA)                      | ≤ 10          | 5           |
| Residue after Ignition            | ≤ 2 ppm       | 1 ppm       |
| Chloride (CI)                     | ≤ 0.08 ppm    | < 0.03 ppm  |
| Phosphate (PO <sub>4</sub> )      | ≤ 0.10 ppm    | < 0.03 ppm  |
| Sulfate (SO <sub>4</sub> )        | ≤ 0.2 ppm     | < 0.2 ppm   |
| Trace Impurities - Aluminum (AI)  | ≤ 40.0 ppb    | < 1.0 ppb   |
| Arsenic and Antimony (as As)      | ≤ 5.0 ppb     | < 2.0 ppb   |
| Trace Impurities – Barium (Ba)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Beryllium (Be) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Bismuth (Bi)   | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities - Boron (B)      | ≤ 10.0 ppb    | < 5.0 ppb   |
| Trace Impurities - Cadmium (Cd)   | ≤ 50 ppb      | < 1 ppb     |
| Trace Impurities – Calcium (Ca)   | ≤ 50.0 ppb    | 2.3 ppb     |
| Trace Impurities - Chromium (Cr)  | ≤ 30.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Cobalt (Co)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Copper (Cu)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Gallium (Ga)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Germanium (Ge) | ≤ 20 ppb      | < 10 ppb    |
| Trace Impurities - Gold (Au)      | ≤ 20 ppb      | < 5 ppb     |
| Heavy Metals (as Pb)              | ≤ 100 ppb     | 100 ppb     |
| Trace Impurities – Iron (Fe)      | ≤ 40.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Lead (Pb)      | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities - Lithium (Li)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb      | < 1 ppb     |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities - Nickel (Ni)    | ≤ 20.0 ppb    | < 5.0 ppb   |
|                                   |               |             |

>>> Continued on page 2 >>>

Nitric Acid 69% CMOS





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

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Cloak

Director Quality Operations, Bioscience Production

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

www.absolutestandards.com



# Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

58111 122223

Sodium (Na)

Lot Number: Description:

Nominal Concentration (µg/mL):

**NIST Test Number:** 

**6UTB** 10000

Weight shown below was diluted to (mL):

3000.4

0.06 Flask Uncertainty 5E-05 Balance Uncertainty

RW#

Number Lot

Nominal

Purity

Uncertainty Assay Purity (%)

Target

Actual

8

38

Recommended Storage:

Ambient (20 °C)

122226

**Expiration Date:** 

Lot # M5807

Solvent:

24002546 Nitric Acid

2%

60.0 (III)

Nitric Acid

Formulated By: 13827 P Aleah O'Brady Back

Reviewed By: Pedro L. Rentas

122223

22223

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

CAS#

SE

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

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

Part # 58111



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

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

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|                    | 40.02<br>40.02<br>40.02<br>40.02   |          |
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|                    | 600000000000000000000000000000000000000  |          |

## Physical Characterization:

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

Certified by:

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

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

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

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

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



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 <sub>CRM/RM</sub> , where two or more methods of characterization are used is the weighted mean of the results:  | Certified Value, X <sub>CRWRM</sub> , 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 <sub>CRM/RM</sub> = (X <sub>a</sub> ) (u <sub>cher a</sub> )  X <sub>a</sub> = mean of Assay Method A with  u <sub>cher a</sub> = 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 $u_{bb}$ = bottle to bottle homogeneity standard uncertainty $u_{lts}$ = long term stability standard uncertainty (storage) $u_{tb}$ = transport stability standard uncertainty | CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ $k = coverage\ factor = 2$ $U_{char\ a} = the\ errors\ from\ characterization$ $U_{bb} = bottle\ to\ bottle\ homogeneity\ standard\ uncertainty$ $U_{tts} = long\ term\ stability\ standard\ uncertainty\ (storage)$ $U_{tts} = transport\ stability\ standard\ uncertainty$ |

#### **Certified Abundance:**

#### **IV's Certified Abundance**

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

#### 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  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

#### 8.0 HAZARDOUS INFORMATION

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

#### 9.0 HOMOGENEITY

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

#### 10.0 QUALITY STANDARD DOCUMENTATION

#### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; 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 <a href="miller.ross@epa.gov">miller.ross@epa.gov</a>. 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 HNO<sub>3</sub>. 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 HNO<sub>3</sub>. 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. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-MS ICSA-0803, AND ICSA-0803 MIXED WITH ICSB-0803 |      |                  |                          |                          |                             |                          |                          |
|--|------|------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element  | CRQL | Part A<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(µg/L) | Part A<br>+Part B<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(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 <a href="miller.ross@epa.gov">miller.ross@epa.gov</a>. 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 HNO<sub>3</sub>. 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 HNO<sub>3</sub>. 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. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-MS ICSA-0803, AND ICSA-0803 MIXED WITH ICSB-0803 |      |                  |                          |                          |                             |                          |                          |
|--|------|------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element  | CRQL | Part A<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(µg/L) | Part A<br>+Part B<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(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

| m/z->  | 1.057 | m/z-><br>2.0E7 | 2.<br>6<br>8 | 5.0E5  | 2.6E6 | 6.OE6 |
|--------|-------|----------------|--------------|--|-------|-------|
|        |       |                |              | the state of the s |       |       |
| 0      |       | 10             |              | ō  |       |       |
| 220    |       | ±              |              | N  |       |       |
| O      |       | N              |              | N  |       |       |
| 230    |       | 130            |              | 30   |       |       |
| 240    |       | .d.            |              |  |       |       |
|        |       | 140            |              | ò  |       |       |
| 0      |       | 180            |              | 50   |       |       |
| N<br>O |       |                |              |  |       |       |
| 0      |       | 180            |              | 9  |       |       |
|        |       | 170            |              | 70   |       |       |
|        |       | 180            |              | <b>8</b>   |       |       |
|        |       | 190            |              | 8  |       |       |
|        |       |                |              | Particular Annual Annua |       |       |
|        |       | 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  | Ĭ          | -        | - |
|---------------------|-------|--------------|-------------------|---------|----------------|---------------|--------|------------------|--------|--------------|----------|--|---|------------|----------|---|
|                     |       | 9            | 9                 | <u></u> | <del>Б</del> е | _             | 8      | 2                |        | 00           | 2        | 2  | Ì   | ı          |          |   |
|                     |       | 70.0>        | 2 1               | 2       | 10.05          | 0.00          | 2      | 20.7             | 3      | -            | ł        | <b>∆0.02</b>   |   |            |          |   |
|                     |       | 2            | 2 8               | 3       | 다              | (             | ٽ<br>ح | ς                | 2      | ೭            |          | 2  |   |            |          |   |
|                     |       | 20.02        | 600               | 3       | 88             | 1000          | 3      | 70.02            | 3      | <u>6</u> 2   | 2000     | A0,02  |   |            |          |   |
|                     | İ     | All          | - C               | 9       | වූ             | ٤             | 5      | 臣                | 1      | Ę            | -        | Ų  |   |            |          |   |
|                     |       | <b>∆</b> 022 | 70.02             | 3       | A)02           | 20.02         | 3      | 40,02            |        | <b>∆</b> 002 | ******** | A003   |   |            |          |   |
|                     |       | 3            | 2                 | 1       | ď,             | =             | 7      | 5                |        | Ho           |          | HF.  |   |            |          |   |
|                     |       | <b>₽</b>     | 20.02             | 3 1     | 40.2           | 20.02         |        | <b>&amp;</b> .02 | -      | 200          | 40.04    | 43   | MANAGEMENT OF THE PARTY OF THE | 11.000     | T SC V   |   |
|                     |       | Z            | Mo                |         | T.             | MD            | ;      | Z o              | L      | =            | Ī        |  | Medical Control   | i de calle | 240      |   |
| (T) = Tamet analyte |       | 40.00        | 20.02             |         | <u> </u>       | 40.02         | , ,    | <u>&amp;</u>     | 2000   | 2            | 20.02    | 2000   |   | ACHIE      | Corifica |   |
|                     | Ŀ     | ~            | 7                 |         | 0              | Pd            | 1 1    | ဂ္ဂ              | 740    | Ş            | N        |  |   | CIOIL      | 3.       |   |
| akao                | 20.6  | 3            | 40,02             | 20.00   | 3              | A)02          | -      | A) 62            | 2000   | 3            | 20.02    | 2000   |   | wy INF     |          |   |
|                     | Ę     | ç            | Sin               | NII.    | D.             | \$            | 1      | 2                | N      | 9            | 7        |  |   | JO CH      | 2        |   |
|                     | 20.02 | 3            | \$0.03<br>\$10.00 | 20.02   | 3              | <b>∆</b> 0,02 | 70.02  | 3                | 20.02  | 3            | 20,52    |  |   | 9/ IIIL/   | 2        |   |
|                     | Ē     | 3            | S                 | K       | 2              | Z             | 200    | <u> </u>         | 2      | 2            | ď        |  |   |            |          | ۱ |
|                     | 20.05 | 3            | <b>A</b> 0.02     | 20.02   |                | 2             | 70.02  | 2                | 20,02  | 3            | ۵        |  |   |            |          |   |
|                     |       | 3 1          | S                 | m       | 1              | <b>=</b>      | 11     | 3                | Te     |              | 7        | ۱  |   |            |          | ı |
|                     | 20.02 |              | A 33              | 40.02   | 20:02          | 3             | 20.02  | 8                | 20.02  |              | 0.02     |  |   |            |          |   |
|                     | 122   | 1            | 7 <sub>n</sub>    | 7       |                | ş             | <      | ;                | _<br>_ |              | W        |  |   |            |          |   |
|                     | <0.02 | 10.01        | 3                 | 800     | 20.02          | 3             | 20.02  |                  | 8,82   | ******       | 200      | No. of the last of |   |            |          |   |

(1) = Target analyte

## Physical Characterization:

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

Certified by:

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

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

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

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

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

Part # 57051

Lot # 120523

Certified Reference Material CRM

M6030



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

R = 8 | 5 | 24

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CERTIFIED WEIGHT REPORT:

800-368-1131

Absolute Standards, Inc.

Part Number: Solvent: 24002546 Lot # Nitric Acid

Lot Number: Description: 57047 122823 Silver (Ag)

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

Weight shown below was diluted to (mL): 4000.30

1. Silver nitrate (Ag)

IN035 J0612AGA1

1000.0

0.10

63.7

6.27992

6.27998

1000.0

2.0

7761-88-B

10 ug/m3

Z

3151

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

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

Formulated By:

Benson Chan

122823

122823

Reviewed By: Pedro L. Rentas

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

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

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

Physical Characterization:

(T)= Target analyte

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

Certified by:

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

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# Certified Reference Material CRM

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

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

CERTIFIED WEIGHT REPORT:

Part Number:

56138 082922

Solvent: 20510011

Nitric Acid

2% 20.0 Nitric Acid

<u>P</u>

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000 Recommended Storage:

Ambient (20 °C) 082925

**Expiration Date:** 

Description: Lot Number:

Strontium (Sr)

Weight shown below was diluted to (mL):

1000.12

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/mL) +/- (µg/mL)

CAS#

Uncertainty

Expanded

41.2

닭

Nominal

Purity Uncertainty Assay

Formulated By: Lawrence Barry

Pedro L. Rentas

Reviewed By:

082922

082922

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

LD50

SRM SRM

Ι₹ orl-rat >2000mg/kg 3153a

Strontium nitrate (Sr 2.5 € 6 5.0E6 [1] Spectrum No.1 IN017 SRZ022018A1 [ 14.495 sec]:58138.D# [Count] [Linear] 10000 99.997 0.10 24.2756 24.2758 10000.1 20.0 10042-76-9

m/z-> 5.0E6 5.0E5 110

120

130

140

150

160

170

190

200

M/z->

10

20

30

40

50

60

0

80

90

100

1.0E6

m/z->

210

220

230

240

250

260

2.5E6

Lot # 082922

Part # 56138

1 of 2

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

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

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

Physical Characterization:

(T)= Target analyte

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

Certified by:

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

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

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

Part # 56138

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# Certified Reference Material CRM

M6023

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

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

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

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

CAS#

OSHA PEL (TWA)

LD50

SRM

| -z/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<br>0                                  |  |
| 230  |       |       | 130      |      | <b>9</b> |       | [ ]4.044 sec]:57081.D# [Count] [Linear] |  |
| 240  |       |       | <u> </u> |      | 4        |       | 57081.                                  |  |
| ō    |       |       | 140      |      | 40       |       | <u> </u>                                |  |
| 250  |       |       | <b>1</b> |      | OI.      |       |   |  |
|      |       |       |          |      |          |       | 000000000000000000000000000000000000000 |  |
| 0    |       |       | 160      |      | 60       |       |   |  |
|      |       |       | 4        |      | 70       |       |   |  |
|      |       |       | 170      |      | 0        |       |   |  |
|      |       |       | 180      |      | 80       |       |   | 100  |
|      |       |       |          |      |          |       |   |  |
|      |       |       | 190      |      | 90       |       |   | or any   |
|      |       |       | 200      |      | 100      |       |   |  |
|      |       |       | ŏ        |      | ŏ        |       |   | See all see al |
|      |       |       |          |      |          |       |   | 0  |

Part # 57081



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

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

|                      |       | ᄧ        | 10            | Ħ.            | Ве           | , to  | ಸ<br>ತ       | AS            |               | Sb       |              | <u>&gt;</u>  |                  | Ī         |       |  |
|----------------------|-------|----------|---------------|---------------|--------------|-------|--------------|---------------|---------------|----------|--------------|--|------------------|-----------|-------|--|
|                      |       | 40.02    | 20.02         | 3             | <u>6</u> .01 | 70.02 | 3            | 4.6           | 5             | <u> </u> |              | A) 02  |                  |           |       |  |
|                      | ŀ     | ဂ္       | 8             | )             | ç            | Ç     | 3            | g             | <u> </u>      | ري<br>و  | -            | 2  |                  | l         |       |  |
|                      |       | 40.02    | 20.02         |               | A).03        | 20.03 | 3            | 40.02         |               | <u>ه</u> | 10.01        | 20.02  |                  |           |       |  |
|                      |       | A        | Ç,            | 9             | <u>.</u>     | Ga    | 2            | ᄪ             | 1 1           | Į        | 5            | 7  | A PROPERTY OF    |           |       |  |
|                      | 20,02 | 3        | 40.02         | 0.01          | 3            | 20.02 | 3            | <b>∆</b> 0.02 |               | 200      | 10.04        | 2000   | CATALOGUE SANCES |           |       |  |
|                      | 100   | ğ        | Į,            | ,             | <u>.</u>     | Ę     | •            | ď             | 110           | ᄪ        | 121          | 321  |                  |           | _     |  |
|                      | 70.02 | 3        | <b>∆</b> 0.02 | ć             | 2            | 40.02 |              | <b>∆</b> .02  | 20.02         | 3        | 20.02        | 200  |                  | ומכפ ויונ | TOO M |  |
|                      |       | Ž        | Mo            | 21.1          | Ę            | M     | q            | Mg            | 100           | T 21     | E            |  |                  | Calo      | 7     |  |
| (T) = Target analyte | 20.02 | 3        | &<br>20.02    | 7.0           | 5            | 40.02 |              | <u>A</u>      | 20.02         | 3        | 20.02        | 200  |                  | ACHILLA   | くのいかい |  |
| et anal              | F     | 4 .      | 7             | 7             | ,            | Pd    | Ş            | ခွ            | IND           | ź        | 2            |  | 8                | ונוטוו    | ÷.    |  |
| yte                  | 2.05  | <b>b</b> | <u>\$</u>     | 20,02         | Š            | <0.02 | 10,02        | 3             | 20.02         | 3        | <0.02        |  |                  | Dy ICE-   | 3     |  |
|                      | Sc    | ,        | S E           | X.            | ,            | 2     | 1            | P.            | Ke            | ;        | 7            |  |                  | WU C      | 20    |  |
|                      | 40.02 | 20:02    | 200           | 40.02         |              | <0.02 | 10.04        | 3             | 20.02         | 2        | <u>&amp;</u> |  |                  | ug/mL)    |       |  |
|                      | Ta    | ,        | <i>n</i>      | Si            |              | ž     | 3            | <u> </u>      | S             | ?        | လ<br>လ       |  | I                |           |       |  |
|                      | 40,02 | 40.04    | 3             | A).02         | i            | 40.2  | 20.03        | 3             | <b>∆</b> 0.02 | · i      | A).2         |  |                  |           |       |  |
|                      | 11    | 011      | ?             | ď             | ŀ            | #     | 1.1          | 1             | Te            |          | 7            |  |                  |           |       |  |
|                      | 40.02 | 70.02    | 3             | 40.02         | 40.04        | AD 03 | _            | 3             | <u>6</u> ,02  | 60.00    | <0.03        |  |                  |           |       |  |
|                      | Zr    | 112      | 7             | ×             | ć            | ş     | <            | ă<br>Y        | _<br>_        |          | W.           | Talenta Commission   |                  |           |       |  |
|                      | 40.02 | 20.02    | 3             | <b>∆</b> 0.02 | 70.02        | 3     | <b>∆</b> .02 |               | A 0.02        | 20.02    | 28           | TOTAL CONTRACTOR AND ADDRESS OF THE PARTY OF |                  |           |       |  |

## Physical Characterization:

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

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

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

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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).

## 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% (mL) 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         | P. 50<br>M. 50<br>M. 50 | m/z->-<br>5,0E8 | 1.0E7 | m/z-> | 1.0E6 | 2.006 |
|-------------|-------------------------|-----------------|-------|-------|-------|-------|
|             |                         |                 |       |       |       |       |
| 210         |                         | 110             |       | 0     |       |       |
| 220         |                         | 1<br>20         |       | N.    |       |       |
| Ö           |                         | Ö               |       | O     |       |       |
| N<br>G<br>O |                         | 130             |       | 90    |       |       |
| N:          |                         |                 |       |       |       |       |
| 200         |                         | 140             |       | 0     |       |       |
| N 50        |                         | 50              |       | 50    |       |       |
| b:          |                         |                 |       |       |       | ı     |
| 260         |                         | 160             |       | 60    |       |       |
|             |                         | 170             |       | 70    |       |       |
|             |                         |                 |       |       |       |       |
|             |                         | <b>d</b> .      |       | 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  |          |   |
|----------------------|--|------------|-------|-------------|--------------|---------|---------------|--|----------|---|
|                      | 40,02  | A),02      | 40.01 | 40.02       | 40.2         | 20.02   | 200           | A  |          |   |
|                      | 5  | ပ          | 유     | సి          | င်           | )<br>[2 | ۶ د           | 2  |          |   |
|                      | 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       | <b>40.02</b> | <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<br>20.02 | A).02 | A).02       | ₫.02         | <0.02   | 0.02          | DESIGNATIONS OF  | oy ICP-N |   |
|                      | Sc   | Sm         | 7     | 공           | 2            | Re      | 7             |  | is (vc   |   |
|                      | 40.02  | A (        | A     | 40.02       | A.02         | <0.02   | <0.02         |  | /mL)     |   |
|                      | ng (   | so s       | ?     | Z,          | Ag           | Si      | æ             |  |          | l |
|                      | <b>40.02</b>   | A 6        | 3 6   | 40.2        | A).02        | 8.02    | <0.2          |  |          |   |
|                      | # 1  | 8          | 1     | 3           | =            | F.      | 4T            |  |          |   |
|                      | 40.02  | A 6.2      | 5 6 6 | 3           | A)02         | 40.02   | <b>∆</b> 0.02 |  |          |   |
|                      | 27   | 7,         | < 5   | <b>\$</b> . | <            | a       | ¥             | SPECIAL SECTION OF SEC |          |   |
|                      | 6.65<br>6.65<br>6.65<br>6.65<br>6.65<br>6.65<br>6.65<br>6.65 | 2 5        | 3 6   | § .         | -3           | A 0.02  | <0.02         | THE REAL PROPERTY.   |          |   |

## Physical Characterization:

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