

8900, Fax: 908 789 8922

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

Order ID: Q1833

Test: Mercury, Metals Group3

**Prepbatch ID:** PB167671,PB167703,

**Sequence ID/Qc Batch ID:** LB135518,LB135523,LB135523,

### Standard ID:

MP85016, MP85017, MP85018, MP85019, MP85020, MP85021, MP85022, MP85023, MP85024, MP85025, MP85026, MP85030, MP85031, MP85031, MP85156, MP85240, MP85241, MP85242, MP85243, MP85393, MP85394, MP85395, MP85396, MP85397, MP85398, MP85399, MP85400, MP85401, MP85402, MP85403, MP85404, MP85405, MP85406, MP85407, MP85407, MP85406, MP85407, MP85407, MP85406, MP85407, MP85406, MP85407, M

### Chemical ID:

M4251, M4465, M4883, M4891, M4916, M5020, M5062, M5288, M5387, M5395, M5429, M5466, M5472, M5496, M5497, M5516, M5521, M5532, M5658, M5747, M5748, M5768, M5789, M5798, M5799, M5800, M5801, M5811, M5814, M5816, M5817, M5820, M5875, M5882, M5884, M5959, M5970, M5978, M5985, M6005, M6012, M6021, M6023, M6028, M6030, M6041, M6058, M6076, M6128, M6137, M6150, M6151, M6152, M6155, M6156, M6158, M6160, W3112, M6150, M6151, M6152, M6151, M6152, M6156, M6158, M6160, W3112, M6150, M6151, M6152, M6151, M6152, M6156, M6158, M6160, W3112, M6150, M6151, M6152, M6151, M6152, M6156, M6158, M6160, W3112, M6150, M6151, M6152, M6151, M6152, M6156, M6158, M6160, W3112, W3112,





| Recipe<br>ID | NAME                          | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------------------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 902          | ICP AES CAL BLK ( SO/ICB/CCB) | MP85016 | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

FROM 125.00000ml of M6151 + 2350.00000ml of W3112 + 25.00000ml of M5789 = Final Quantity: 2500.000 ml

| Recipe<br>ID | NAME                 | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 907          | ICP AES STD S ( S5 ) | MP85017    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

**FROM** 

5.00000ml of M5395 + 5.00000ml of M5466 + 5.00000ml of M5472 + 5.00000ml of M5816 + 5.00000ml of M5875 + 5.00000ml of M5970 + 5.00000ml of M6076 + 5.00000ml of M6160 + 455.00000ml of MP85016 = Final Quantity: 500.000 ml





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### Metals STANDARD PREPARATION LOG

| 910 ICP AES STD S4 MP85018 03/26/2025 05/02/2025 Kareem Khairalla None None 04/07/2025 |   | <u>cipe</u><br>ID | <u>NAME</u>    | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--|---|-------------------|----------------|---------|------------|--------------------|----------------|----------------|------------------|-------------------------------|
|  | 9 | 910               | ICP AES STD S4 | MP85018 | 03/26/2025 | 05/02/2025         |                | None           | None             | 04/07/2025                    |

**FROM** 50.00000ml of MP85016 + 50.00000ml of MP85017 = Final Quantity: 100.000 ml

| Recipe<br>ID | NAME           | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 909          | ICP AES STD S3 | MP85019    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

**FROM** 25.00000ml of MP85017 + 75.00000ml of MP85016 = Final Quantity: 100.000 ml



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### **Metals STANDARD PREPARATION LOG**

| Recipe<br>ID | NAME           | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 3913         | ICP AES STD S2 | MP85020 | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

FROM 16.00000ml of MP85017 + 184.00000ml of MP85016 = Final Quantity: 200.000 ml

| Recipe<br>ID | NAME                     | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|--------------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 2950         | ICP AES S1/CRI STOCK STD | MP85021    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

### **FROM**

 $0.03000 \text{ml of M5798} + 0.03000 \text{ml of M6028} + 0.04000 \text{ml of M6137} + 0.05000 \text{ml of M5496} + 0.05000 \text{ml of M5658} + 0.05000 \text{ml of M5811} + 0.05000 \text{ml of M6030} + 0.06000 \text{ml of M5747} + 0.10000 \text{ml of M4883} + 0.10000 \text{ml of M5472} + 0.10000 \text{ml of M5521} + 0.10000 \text{ml of M5801} + 0.10000 \text{ml of M5801} + 0.10000 \text{ml of M5820} + 0.10000 \text{ml of M5970} + 0.10000 \text{ml of M6128} + 0.15000 \text{ml of M5800} + 0.20000 \text{ml of M5748} + 0.20000 \text{ml of M5799} + 0.20000 \text{ml of M6021} + 0.20000 \text{ml of M6023} + 0.25000 \text{ml of M5466} + 0.25000 \text{ml of M5466} + 0.50000 \text{ml of M5387} + 0.50000 \text{ml of M5814} + 1.00000 \text{ml of M5288} + 1.00000 \text{ml of M5768} + 1.00000 \text{ml of M5978} + 1.00000 \text{ml of M6156} + 2.00000 \text{ml of M5816} + 77.68000 \text{ml of MP85016} = \text{Final Quantity: 100.000} \quad \text{ml}$ 



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### Metals STANDARD PREPARATION LOG

| Recipe<br>ID | <u>NAME</u>             | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 2951         | ICP AES S1/CRI WORK STD | MP85022    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

FROM 2.00000ml of MP85021 + 98.00000ml of MP85016 = Final Quantity: 100.000 ml

| Recipe<br>ID | NAME             | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 912          | ICP AES ICV SOLN | MP85023    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

FROM 0.02500ml of M5020 + 0.02500ml of M5429 + 0.02500ml of M5817 + 0.10000ml of M5466 + 0.25000ml of M5472 + 0.25000ml of M6058 + 10.00000ml of M6150 + 89.77500ml of MP85016 = Final Quantity: 100.000 ml





| Recipe<br>ID | NAME              | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 904          | ICP AES ICSA SOLN | MP85024    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

**FROM** 25.00000ml of M6152 + 225.00000ml of MP85016 = Final Quantity: 250.000 ml

| Recipe<br>ID | NAME                 | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 3494         | ICP AES ICSAB SOLN-1 | MP85025    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

FROM 0.01000ml of M5020 + 0.01000ml of M5817 + 0.10000ml of M5472 + 0.10000ml of M5970 + 0.10000ml of M6076 + 10.00000ml of M6152 + 10.00000ml of M6155 + 79.50000ml of MP85016 = Final Quantity: 100.000 ml





| Recipe<br>ID | NAME.            | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|------------------|---------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 911          | ICP AES CCV SOLN | MP85026 | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

| <b>FROM</b> | 50.00000ml of MP85016 + 50.00000ml of MP85017 | = Final Quantity: 100.000 ml |
|-------------|---|------------------------------|
|-------------|---|------------------------------|

| Recipe<br>ID | NAME                 | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 919          | ICP AES INTERNAL STD | MP85030    | 03/26/2025 | 05/02/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

FROM 1.00000ml of M5959 + 10.00000ml of M5985 + 1969.00000ml of W3112 + 20.00000ml of M5789 = Final Quantity: 2000.000 ml





| Recipe<br>ID | NAME<br>RINSE SOLN | NO.     | Prep Date<br>03/26/2025 | Expiration Date 05/02/2025 | Prepared<br>By      | <u>ScaleID</u> | <u>PipettelD</u> | Supervised By Sarabjit Jaswal |
|--------------|--------------------|---------|-------------------------|----------------------------|---------------------|----------------|------------------|-------------------------------|
| 513          | RINSE SOLIN        | MP85031 | 03/20/2025              | 05/02/2025                 | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

**FROM** 200.00000ml of M5789 + 9800.00000ml of W3112 = Final Quantity: 10000.000 ml

| Recipe<br>ID | NAME   | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By      | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|--------|------------|------------|--------------------|---------------------|----------------|------------------|-------------------------------|
| 170          | 1:1HCL | MP85156    | 04/07/2025 | 08/18/2025         | Kareem<br>Khairalla | None           | None             | 04/07/2025                    |

FROM 1250.00000ml of M6151 + 1250.00000ml of W3112 = Final Quantity: 2500.000 ml





| Recipe<br>ID | NAME.            | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|------------------|---------|------------|--------------------|----------------|----------------|------------------|-------------------------------|
| 3965         | 2:1 H2SO4 : HNO3 | MP85240 | 04/16/2025 | 10/16/2025         | Mohan Bera     | None           | None             | 04/00/0005                    |
|              |                  |         |            |                    |                |                |                  | 04/29/2025                    |

FROM 1600.00000ml of M6041 + 800.00000ml of M6158 = Final Quantity: 3200.000 ml

| Recipe<br>ID | <u>NAME</u>                            | NO.     | Prep Date  | Expiration<br>Date | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u>              | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|--|---------|------------|--------------------|------------------------------|-----------------------------|------------------|-------------------------------|
| 65           | POTASSIUM PERMANGANATE<br>SOLUTION 5 % | MP85241 | 04/16/2025 | 10/16/2025         |                              | METALS_SCA<br>LE_3 (M SC-3) |                  | 04/29/2025                    |

**FROM** 100.00000gram of M4916 + 2000.00000ml of W3112 = Final Quantity: 2000.000 ml



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|--------------|--------------------------------------|------------|------------|--------------------|------------------------------|-----------------------------|------------------|-------------------------------|
| 66           | POTASSIUM PERSULFATE<br>SOLUTION 5 % | MP85242    | 04/16/2025 | 08/06/2025         |                              | METALS_SCA<br>LE_3 (M SC-3) |                  | 04/29/2025                    |

| <b>FROM</b> | 100.00000ml of M4465 + 2000.00000ml of W3112 = Final Quantity: 2000.000 ml |
|-------------|--|
|-------------|--|

| Recipe<br>ID | NAME_                                   | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u>              | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|---|---------|------------|--------------------|----------------|-----------------------------|------------------|-------------------------------|
| 67           | SODIUM CHLORIDE -<br>HYDROXYL- CHLORIDE | MP85243 | 04/16/2025 | 06/25/2025         |                | METALS_SCA<br>LE_3 (M SC-3) |                  | 04/29/2025                    |

FROM 2000.0000ml of W3112 + 240.00000gram of M4251 + 240.00000gram of M5884 = Final Quantity: 2000.000 ml





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### Metals STANDARD PREPARATION LOG

| ID N | <u>NAME</u>                   | <u>NO.</u> | Prep Date  | Expiration<br>Date | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabiit Jaswal |
|------|-------------------------------|------------|------------|--------------------|------------------------------|----------------|------------------|-----------------|
|      | STANNOUS CHLORIDE<br>SOLUTION | MP85393    | 04/22/2025 | 04/23/2025         | Mohan Bera                   | None           | None             | 04/29/2025      |

| Recipe<br>ID | NAME.   | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By Sarabjit Jaswal |
|--------------|---|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|
| 871          | MERCURY INTERMEDIATE B<br>250PPB WORKING STD. | MP85394 | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG |                               |

FROM 1.00000ml of M6158 + 2.50000ml of M5062 + 96.50000ml of W3112 = Final Quantity: 100.000 ml





### **Metals STANDARD PREPARATION LOG**

| Recipe<br>ID | NAME            | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By Sarabjit Jaswal |  |  |  |
|--------------|-----------------|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|--|--|--|
| 1340         | Hg 0.00 PPB STD | MP85395 | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG | •                             |  |  |  |
|              | A)              |         |            |                    |                |                |                          |                               |  |  |  |

<u>FROM</u> 2.50000ml of M6158 + 247.50000ml of W3112 = Final Quantity: 250.000 ml

| Recipe<br>ID | NAME       | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipettelD</u>         | Supervised By Sarabjit Jaswal |
|--------------|------------|------------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|
| 2750         | Нд 0.05ррb | MP85396    | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG | ,                             |

2.50000ml of M6158 + 247.45000ml of W3112 + 0.05000ml of MP85394 = Final Quantity: 250.000 ml **FROM** 





| 1341 Hg 0.2 PPB STD MP85397 04/22/2025 04/23/2025 Mohan Bera None METALS_PIP ETTE_5 (HG 04/29/2025 | Recipe<br>ID | NAME           | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipettelD</u> | Supervised By Sarabjit Jaswal |
|--|--------------|----------------|------------|------------|--------------------|----------------|----------------|------------------|-------------------------------|
|  | 1341         | Hg 0.2 PPB STD | MP85397    | 04/22/2025 | 04/23/2025         | Mohan Bera     | None           | _                | ,                             |

| FROM | 2.50000ml of M6158 + 247.30000ml of W3112 + 0.20000ml of MP85394 | = Final Quantity: 250.000 ml |
|------|--|------------------------------|
|------|--|------------------------------|

| Recipe<br>ID | NAME           | <u>NO.</u> | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By Sarabjit Jaswal |
|--------------|----------------|------------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|
| 1342         | Hg 2.5 PPB STD | MP85398    | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG | •                             |

**FROM** 2.50000ml of M6158 + 245.0000ml of W3112 + 2.50000ml of MP85394 = Final Quantity: 250.000 ml



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### **Metals STANDARD PREPARATION LOG**

| Recipe<br>ID | NAME           | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipettelD</u>         | Supervised By Sarabjit Jaswal |  |  |
|--------------|----------------|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|--|--|
| 1343         | Hg 5.0 PPB STD | MP85399 | 04/22/2025 | 04/23/2025         | Mohan Bera     | None           | METALS_PIP<br>ETTE_5 (HG | •                             |  |  |
|              | A)             |         |            |                    |                |                |                          |                               |  |  |

**FROM** 2.50000ml of M6158 + 242.50000ml of W3112 + 5.00000ml of MP85394 = Final Quantity: 250.000 ml

| Recipe<br>ID | <u>NAME</u>    | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By Sarabjit Jaswal |
|--------------|----------------|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|
| 1344         | Hg 7.5 PPB STD | MP85400 | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG | •                             |

**FROM** 2.50000ml of M6158 + 240.00000ml of W3112 + 7.50000ml of MP85394 = Final Quantity: 250.000 ml



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### Metals STANDARD PREPARATION LOG

| Recipe<br>ID | NAME.           | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By Sarabjit Jaswal |  |  |
|--------------|-----------------|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|--|--|
| 1345         | Hg 10.0 PPB STD | MP85401 | 04/22/2025 | 04/23/2025         | Mohan Bera     | None           | METALS_PIP<br>ETTE_5 (HG |                               |  |  |
|              | A)              |         |            |                    |                |                |                          |                               |  |  |

**FROM** 2.50000ml of M6158 + 237.50000ml of W3112 + 10.00000ml of MP85394 = Final Quantity: 250.000 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> | Sarabjit Jaswal |
| 1346      | Hg ICV SOLUTION | MP85402    | 04/22/2025 | 04/23/2025  | Mohan Bera |                | METALS_PIP       |                 |
|           |                 |            |            |             |            |                | ETTE_5 (HG       | 04/29/2025      |

**FROM** 2.50000ml of M5532 + 2.50000ml of M6158 + 245.00000ml of W3112 = Final Quantity: 250.000 ml



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### Metals STANDARD PREPARATION LOG

| Recipe<br>ID | NAME.                      | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipetteID</u>         | Supervised By Sarabjit Jaswal |
|--------------|----------------------------|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|
| 1351         | ICB (Hg 0.00 PPB SOLUTION) | MP85403 | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG |                               |
|              |                            |         |            |                    |                |                | A)                       |                               |

**FROM** 2.50000ml of M6158 + 247.50000ml of W3112 = Final Quantity: 250.000 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> | Sarabjit Jaswal |
| 1358      | CCV (Hg 5.0 PPB SOLUTION) | MP85404    | 04/22/2025 | 04/23/2025  | Mohan Bera |                | METALS_PIP       |                 |
|           |                           |            |            |             |            |                | ETTE_5 (HG       | 04/29/2025      |

FROM 485.00000ml of W3112 + 5.00000ml of M6158 + 10.00000ml of MP85394 = Final Quantity: 500.000 ml



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|--------------|----------------------------|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|--|--|
| 1352         | CCB (Hg 0.00 PPB SOLUTION) | MP85405 | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG |                               |  |  |
|              | A)                         |         |            |                    |                |                |                          |                               |  |  |

**FROM** 495.00000ml of W3112 + 5.00000ml of M6158 = Final Quantity: 500.000 ml

| Recipe<br>ID | <u>NAME</u>                      | NO.     | Prep Date  | Expiration<br>Date | Prepared<br>By | <u>ScaleID</u> | <u>PipettelD</u>         | Supervised By Sarabjit Jaswal |
|--------------|----------------------------------|---------|------------|--------------------|----------------|----------------|--------------------------|-------------------------------|
| 1349         | CRA/CRI (Hg 0.2 PPB<br>SOLUTION) | MP85406 | 04/22/2025 | 04/23/2025         | Mohan Bera     |                | METALS_PIP<br>ETTE_5 (HG |                               |

**FROM** 2.50000ml of M6158 + 247.30000ml of W3112 + 0.20000ml of MP85394 = Final Quantity: 250.000 ml



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### **Metals STANDARD PREPARATION LOG**

| Recipe<br>ID<br>1350 | NAME CHK STD (Hg 7.0 PPB SOLUTION) | NO.<br>MP85407 | Prep Date<br>04/22/2025 | Expiration Date 04/23/2025 | Prepared<br>By<br>Mohan Bera | <u>ScaleID</u><br>None | PipettelD  METALS_PIP ETTE_5 (HG | Supervised By Sarabjit Jaswal 04/29/2025 |
|----------------------|------------------------------------|----------------|-------------------------|----------------------------|------------------------------|------------------------|----------------------------------|--|
| FROM                 | 2.50000ml of M6158 + 240.50000ml   | of W3112 +     | 1<br>7.00000ml of       | MP85394 = F                | inal Quantity: 25            | 50.000 ml              | A)                               | STILUIZOZO                               |
|                      |                                    |                |                         |                            |                              |                        |                                  |  |



| Supplier                    | ItemCode / ItemName  | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|--|------------|--------------------|----------------------------|--------------------------------|-------------------|
| Seidler Chemical            | BA-2196-01 /<br>Hydroxylamine<br>Hydrochloride, Crystal<br>(cs/4x500g) | 0000215387 | 06/25/2025         | 12/19/2018 /<br>mohan      | 12/05/2018 /<br>mohan          | M4251             |
| Supplier                    | ItemCode / ItemName  | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-3238-05 / Potassium<br>Persulfate (2.5kg)                           | 0000234156 | 08/06/2025         | 07/23/2019 /               | 07/25/2019 /<br>manojkumar     | M4465             |
| 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  | 070221     | 09/07/2025         | 08/06/2021 /<br>jaswal     | 08/05/2021 /<br>jaswal         | M4883             |
| Supplier                    | ItemCode / ItemName  | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58030 / Zinc, Zn, 500 ml,<br>1000 PPM                                  | 031921     | 05/19/2025         | 08/25/2021 /<br>bin        | 08/05/2021 /<br>jaswal         | M4891             |
| Supplier                    | ItemCode / ItemName  | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-3227-05 / Potassium<br>Permanganate (2.5kg)                         | 210800     | 03/31/2026         | 11/30/2022 /<br>mohan      | 07/28/2021 /<br>mohan          | M4916             |
|                             |  |            |                    | Data Ouranad /             | Received Date /                | 0111-             |
| Supplier                    | ItemCode / ItemName  | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |



| Supplier                     | ItemCode / ItemName   | Lot #        | Expiration<br>Date          | Date Opened /<br>Opened By           | Received Date /<br>Received By           | Chemtech<br>Lot #     |
|------------------------------|---|--------------|-----------------------------|--------------------------------------|--|-----------------------|
| Inorganic<br>Ventures        | MSHG-10PPM /<br>MERCURY HCI 125mL<br>10ug/mL                    | S2-HG709270  | 09/22/2026                  | 05/28/2022 /<br>mohan                | 01/27/2022 /<br>mohan                    | M5062                 |
| 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.  | 57056 / Ba, 1000 PPM,<br>125 ml                                 | 072122       | 07/21/2025                  | 11/01/2022 /<br>jaswal               | 09/18/2022 /<br>jaswal                   | M5387                 |
| Supplier                     | ItemCode / ItemName   | Lot #        | Expiration<br>Date          | Date Opened /<br>Opened By           | Received Date /<br>Received By           | Chemtech<br>Lot #     |
|                              |   |              |                             |                                      |  |                       |
| Inorganic<br>Ventures        | CLPP-CAL-3 / CLP CAL<br>SOLUTION #3, 125mL                      | T2-MEB714159 | 01/13/2027                  | 01/30/2024 /<br>bin                  | 09/19/2022 /<br>bin                      | M5395                 |
| _                            |   | T2-MEB714159 | 01/13/2027  Expiration Date |                                      |  | M5395  Chemtech Lot # |
| Ventures                     | SOLUTION #3, 125mL  |              | Expiration                  | bin  Date Opened /                   | bin  Received Date /                     | Chemtech              |
| Ventures  Supplier  Absolute | SOLUTION #3, 125mL  ItemCode / ItemName  57103 / Li, 10000 PPM, | Lot #        | Expiration<br>Date          | Date Opened / Opened By 01/30/2023 / | Received Date / Received By 01/26/2023 / | 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.        | 57038 / Sr, 1000 PPM,<br>125 ml                   | 082922       | 08/29/2025         | 01/14/2025 /<br>Jaswal     | 03/16/2023 /<br>jaswal         | M5472             |
| 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         | 08/15/2023 /<br>jaswal     | 03/17/2023 /<br>bin            | M5496             |
| Supplier                           | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.        | 58120 / Ca, 10000 PPM,<br>500 ml                  | 031523       | 03/15/2026         | 03/18/2023 /<br>bin        | 03/17/2023 /<br>bin            | M5497             |
| Supplier                           | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc.        | 58111 / Na, 10000 PPM,<br>500 ml                  | 022123       | 11/06/2025         | 11/06/2024 /<br>kareem     | 03/17/2023 /<br>bin            | M5516             |
|                                    |   |              |                    |                            |                                |                   |
| Supplier                           | ItemCode / ItemName                               | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Supplier  Absolute Standards, Inc. | ItemCode / ItemName  58029 / Cu, 1000 PPM, 500 ml | Lot # 102622 |                    |                            |                                |                   |
| Absolute                           | 58029 / Cu, 1000 PPM,                             |              | Date               | Opened By<br>11/21/2022 /  | Received By 11/20/2022 /       | 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. | 58024 / Chromium, Cr,<br>500 ml, 1000 PPM                | 060523     | 06/05/2026         | 08/28/2023 /<br>jaswal     | 08/25/2023 /<br>jaswal         | M5658             |
| Supplier                    | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | / Lead (Pb) 1000PPM                                      | 100923     | 10/09/2026         | 05/20/2024 /<br>Jaswal     | 12/20/2023 /<br>jaswal         | M5747             |
| Supplier                    | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | / Nickel (Ni) 1000PPM                                    | 091223     | 09/12/2026         | 01/02/2024 /<br>bin        | 12/20/2023 /<br>jaswal         | M5748             |
| Supplier                    | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58112 / Mg, 10000 PPM,<br>500 ml                         | 091823     | 09/18/2026         | 01/08/2024 /<br>bin        | 01/03/2024 /<br>bin            | M5768             |
| 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) | 23G1262003 | 07/30/2025         | 02/08/2024 /<br>Al-Terek   | 06/26/2023 /<br>Al-Terek       | M5789             |
| Supplier                    | ItemCode / ItemName                                      | Lot #      | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57004 / Be, 1000 PPM,<br>125 ml                          | 102523     | 10/25/2026         | 02/09/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5798             |



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| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57050 / Sn, 1000 PPM,<br>125 ml  | 071123 | 07/11/2026         | 02/09/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5799             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57027 / CO, 1000 PPM,<br>125 ml  | 091923 | 09/19/2026         | 05/31/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5800             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration 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. | 58126 / Fe, 10000 PPM,<br>500 ml | 051523 | 05/15/2026         | 02/06/2025 /<br>kareem     | 01/03/2024 /<br>jaswal         | M5811             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57005 / B, 1000 PPM, 125 ml      | 071123 | 07/11/2026         | 03/26/2024 /<br>Sohil      | 01/03/2024 /<br>jaswal         | M5814             |
| 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. | 57015 / P, 1000 PPM, 125<br>ml                           | 091123       | 09/11/2026         | 05/01/2024 /<br>jaswal     | 02/09/2024 /<br>jaswal         | M5820             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CLPP-CAL-1 / CLP CAL<br>SOLUTION #1, 125mL               | T2-MEB714417 | 01/27/2027         | 04/19/2024 /<br>jaswal     | 02/22/2024 /<br>jaswal         | M5875             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-3980-01 / Stannous<br>Chloride (cs/4x500g)            | 232820       | 08/31/2028         | 04/30/2024 /<br>mohan      | 04/25/2024 /<br>mohan          | M5882             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | BA-3624-05 / Sodium<br>Chloride, Crystal<br>(cs/4x2.5kg) | 0000281938   | 07/06/2026         | 04/30/2024 /<br>mohan      | 04/25/2024 /<br>mohan          | M5884             |
| Supplier                    | ItemCode / ItemName                                      | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|                             | CGY10-1 / YTTRIUM  | V2-Y740548   | 02/20/2029         | 07/01/2024 /               | 06/14/2024 /                   | M5959             |



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| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|--|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57003 / Li, 1000 PPM, 125<br>ml                                | 061224       | 06/21/2027         | 07/01/2024 /<br>Jaswal     | 07/01/2024 /<br>Jaswal         | M5970             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CGTI1-1 / TITANIUM<br>125mL 1000ug/mL                          | T2-TI719972  | 06/17/2027         | 08/07/2024 /<br>jaswal     | 02/22/2024 /<br>Jaswal         | M5978             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CGIN10-5 / INDIUM 1 x 500 ml                                   | U2-IN729349  | 02/21/2028         | 10/08/2024 /<br>Jaswal     | 06/14/2024 /<br>Jaswal         | M5985             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | WW-LFS-1 / Laboratory<br>Fortified Stock Solution 1,<br>125 ml | T2-MEB723367 | 08/30/2026         | 04/15/2025 /<br>JANVI      | 05/14/2024 /<br>Jaswal         | M6005             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | WW-LFS-2 / Laboratory<br>Fortified Stock Solution 2,<br>125 ml | U2-MEB731108 | 09/17/2025         | 03/17/2025 /<br>Eman       | 05/14/2024 /<br>Jaswal         | M6012             |
|                             |  |              | Expiration         | Date Opened /              | Received Date /                | Chemtech          |
| Supplier                    | ItemCode / ItemName  | Lot #        | Date               | Opened By                  | Received By                    | 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. | 57081 / TI, 1000 PPM, 125<br>ml  | 0624724      | 06/27/2027         | 08/05/2024 /<br>kareem     | 08/05/2024 /<br>Jaswal         | M6023             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57048 / Cd, 1000 PPM,<br>125 ml  | 070124       | 07/01/2027         | 08/05/2024 /<br>kareem     | 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 # |
| Seidler Chemical            | BA-9673-33 / Sulfuric Acid,<br>Instra-Analyzed (cs/6c2.5L)                   | 23D2462010   | 03/20/2028         | 08/16/2024 /<br>mohan      | 08/16/2024 /<br>mohan          | M6041             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CHEM-QC-4 /<br>CHEM-QC-4, Second<br>Source, 1000 ug/ml, B, Mo,<br>Si, Sn, Ti | V2-MEB746173 | 01/29/2026         | 01/29/2025 /<br>JANVI      | 08/22/2024 /<br>Jaswal         | M6058             |
| Supplier                    | ItemCode / ItemName  | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | Z9651Q /<br>CHEM-CLP-4/.25L  | V2-MEB746762 | 01/01/2026         | 01/01/2025 /<br>kareem     | 09/19/2024 /<br>kareem         | M6076             |



| 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                                   | 101124          | 10/11/2027         | 01/13/2025 /<br>kareem     | 01/13/2025 /<br>kareem         | M6128             |
| Supplier                    | ItemCode / ItemName   | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CGSI1-1 / SILICON 125mL<br>1000ug/mL                              | V2-SI744713     | 07/10/2029         | 01/14/2025 /<br>Jaswal     | 10/03/2024 /<br>Jaswal         | M6137             |
| 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                             | ICV1-1014       | 07/07/2025         | 02/07/2025 /<br>JANVI      | 04/20/2021 /<br>JANVI          | M6150             |
| 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) | 22G2862015      | 08/18/2025         | 02/18/2025 /<br>Sagar      | 01/15/2025 /<br>Sagar          | M6151             |
|                             | (C5/0X2.3L)   |                 |                    |                            |                                |                   |
| Supplier                    | ItemCode / ItemName   | Lot #           | Expiration Date    | Date Opened /<br>Opened By | Received Date /                | Chemtech<br>Lot # |
| Supplier<br>EPA             |   | Lot # ICSA-1211 | -                  | -                          |                                |                   |
|                             | ItemCode / ItemName PART A / ICSA ( ICP )                         |                 | Date               | Opened By 02/24/2025 /     | Received By 04/20/2021 /       | Lot #             |



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| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57042 / Mo, 1000 PPM,<br>125 ml | 032123 | 03/21/2026         | 11/06/2024 /<br>JANVI      | 06/12/2024 /<br>JANVI          | M6156             |

| 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 | 03/25/2029         | 03/10/2025 /<br>Eman       | 02/02/2025 /<br>Sagar          | M6158             |
|                  |  |            |                    |                            |                                |                   |

| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57051 / Sb, 1000 PPM,<br>125 ml | 071724 | 03/24/2026         | 03/24/2025 /<br>kareem     | 10/18/2024 /<br>kareem         | M6160             |

| 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             |





1 Reagent Lane Fair Lawn, NJ 07410 201,796,7100 tel

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System

Standard ISO9001:2015 by SAI Global Certificate Number CERT - 0120633 201,796,1329 fax

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Thermo Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Products are for research use or further manufacturing. Not for direct administration to humans or animals. It is the responsibility of the final formulator and end user to determine suitability based upon the intended use of the end product. Products are tested to meet the analytical requirements of the noted grade. The following information is the actual analytical results obtained.

|                   |  | · · · · · · · · · · · · · · · · · · · |                      |  |  |
|-------------------|--|---------------------------------------|----------------------|--|--|
| Catalog Number    | T142   | Quality Test / Release Date           | 08/17/2023           |  |  |
| Lot Number        | 232820   |                                       |                      |  |  |
| Description       | STANNOUS CHLORIDE, DIHYDRAT  | TE CERTIFIED ACS (Suitable for Me     | rcury Determination) |  |  |
| Country of Origin | United States  | Suggested Retest Date                 | Aug/2028             |  |  |
| Chemical Origin   | Inorganic-non animal   |                                       |                      |  |  |
| BSE/TSE Comment   | No animal products are used as starting raw material ingredients, or used in processing, including lubricants processing aids, or any other material that might migrate to the finished product. |                                       |                      |  |  |

| N/A               |           |                            |                     |  |  |  |
|-------------------|-----------|----------------------------|---------------------|--|--|--|
| Result Name       | Units     | Specifications             | Test Value          |  |  |  |
| APPEARANCE        |           | REPORT                     | Clear crystals      |  |  |  |
| ASSAY             | %         | Inclusive Between 98 - 103 | 100.65              |  |  |  |
| CALCIUM           | %         | <= 0.005                   | 0.0017              |  |  |  |
| IDENTIFICATION    | PASS/FAIL | = PASS TEST                | PASS TEST           |  |  |  |
| IRON (Fe)         | %         | <= 0.003                   | 0.0011              |  |  |  |
| LEAD (Pb)         | %         | <= 0.01                    | 0.0006              |  |  |  |
| MERCURY (Hg)      | ppm       | <= 0.05                    | <0.05               |  |  |  |
| POTASSIUM (K)     | %         | <= 0.005                   | 0.0001              |  |  |  |
| SODIUM (Na)       | %         | <= 0.01                    | <0.01               |  |  |  |
| SOLUBILITY IN HCL | PASS/FAIL | = PASS TEST                | PASS TEST           |  |  |  |
| SULFATE (SO4)     | PASS/FAIL | = P.T. (ABOUT 0.003%)      | P.T. (ABOUT 0.003%) |  |  |  |

Harout Sahagian - Quality Control Supervisor - Fair Lawn

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

**Expiration Date:** 

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

**SDS Information** 

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

**NIST** SRM

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

1 of 2

www.absolutestandards.com

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

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

|                               | I            | ₩ !    | 묤            | Ве           | ם ל           | 烎     | As       | 00    | 2            | 2                                      |  |          |   |
|-------------------------------|--------------|--------|--------------|--------------|---------------|-------|----------|-------|--------------|--|--|----------|---|
|                               | 10.04        | 200    | A (2)        | 10.02        | 0.02          | 3     | 8        | 20.05 | 3            | 40.02                                  |  |          |   |
|                               | 2            | 2 8    | 3            | Ţ.           | , E           | ?     | င္ပ      | 2     | )            | 2                                      |  |          |   |
|                               | 70.02        | 2 6 6  | 8            | 40.02        | 20.02         | 3     | <u> </u> | 9.2   | ,            | 7                                      | STATE OF THE STATE |          |   |
|                               | - Au         | } {    | 3            | G            | g             | 2     | 달'       | ķ     | , ,          | ٧                                      |  |          |   |
|                               | 20.02        | 3 6    | 3            | 40.02        | 20.02         | 3     | 8        | 40.02 | 20.02        | 2000                                   | STATISTICS AND A STATISTICS.   |          |   |
|                               | 20           | 2 5    | <del>,</del> | 4            | ing           | • }   | 3'       | Но    | 111          | JH.                                    | S0211  | L        |   |
|                               | 20.02        | 20.02  | 3            | <b>∆</b> 0,2 | <b>♦</b> 0.02 |       | A<br>S   | 40.02 | 20.02        | 200                                    | PHONE SPECIES  | race Me  |   |
|                               | 20           | MIO    | 5,           | He           | Mn            | ď     | ≤        | Ε.    | Ē            |  |  | Metals   | I |
| <li>(T) = Target analyte</li> | 40.02        | 20.02  | 5            | <b>∆</b> 0.2 | <0.02         | 10.01 | 200      | 40,02 | 20,02        | 2000                                   |  | Verifica |   |
| jet anal                      | ×            | 7      | ,            | 9            | Pd            | ξ     | <u></u>  | 3     | 2            |  |  | tion     |   |
| yte                           | A0.22        | \$0.02 |              | A) (2)       | 40.02         | 70.02 | 3        | <0.02 | 20.02        | 5                                      |  | by ICP-  |   |
|                               | Sc           | Sm     | •            | 2            | Rb            | 2     | ğ        | R     | 7            |  |  | MS (     |   |
|                               | <b>40.02</b> | 40.02  |              | <b>∆</b>     | 40,02         | 20.02 | 3        | 40.02 | 40.02        |  |  | Jg/mL)   |   |
|                               | Ta           | S      |              | ę            | Z             | 700   |          | S.    | Š.           | ,                                      | National Control   |          | ı |
|                               | Ð.02         | 40.02  | 40.04        | 3            | 40.2          | 20.02 | 3        | A0.02 | 40.2         |  |  |          |   |
|                               | Ti           | Sn     | 1111         | 7            | 7             | 11    | 1 ;      | 7     | 7            |  |  |          |   |
|                               | <0.02        | 40.02  | 20.07        | 3            | <b>∆</b> 0,02 | <0.02 |          | 40.02 | 40.02        | The State State of the                 |  |          |   |
|                               | Zt           | Zn     |              | <            | <b>¥</b>      | <     |          | =     | Ø            | The second second                      |  |          |   |
|                               | <0.02        | <0.02  | 20.02        | 3            | <0.02         | 40.02 | 20.02    | 3     | <b>40.02</b> | 10000000000000000000000000000000000000 |  |          |   |

### Physical Characterization:

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

Certified by:

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

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

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

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

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

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

Part # 57048

2 of 2



### Certificate of Analysis

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CLPP-CAL-1

Lot Number: T2-MEB714417

Matrix: 5% (v/v) HNO3

Value / Analyte(s): 5 000 µg/mL ea:

Calcium, Potassium, Magnesium, Sodium,

2 000 µg/mL ea:

Aluminum, Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese, 250 μg/mL ea:

Silver, Copper,

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

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

**Density:** 1.118 g/mL (measured at  $20 \pm 4$  °C)

### **Assay Information:**

| 133 | ay iiii Oi iii atioii. |             |           |              |
|-----|------------------------|-------------|-----------|--------------|
|     | ANALYTE                | METHOD      | NIST SRM# | SRM LOT#     |
|     | Ag                     | ICP Assay   | 3151      | 160729       |
|     | Ag                     | Volhard     | 999c      | 999c         |
|     | Al                     | ICP Assay   | 3101a     | 140903       |
|     | Al                     | EDTA        | 928       | 928          |
|     | Ва                     | ICP Assay   | 3104a     | 140909       |
|     | Ва                     | Gravimetric |           | See Sec. 4.2 |
|     | Ве                     | ICP Assay   | 3105a     | 090514       |
|     | Ве                     | Calculated  |           | See Sec. 4.2 |
|     | Ca                     | ICP Assay   | 3109a     | 130213       |
|     | Ca                     | EDTA        | 928       | 928          |
|     | Co                     | ICP Assay   | 3113      | 190630       |
|     | Co                     | EDTA        | 928       | 928          |
|     | Cr                     | ICP Assay   | 3112a     | 170630       |
|     | Cr                     | Calculated  |           | See Sec. 4.2 |
|     | Cu                     | ICP Assay   | 3114      | 121207       |
|     | Cu                     | EDTA        | 928       | 928          |
|     | Fe                     | ICP Assay   | 3126a     | 140812       |
|     | Fe                     | EDTA        | 928       | 928          |
|     | K                      | ICP Assay   | 3141a     | 140813       |
|     | K                      | Gravimetric |           | See Sec. 4.2 |
|     | Mg                     | ICP Assay   | 3131a     | 140110       |
|     | Mg                     | EDTA        | 928       | 928          |
|     | Mn                     | ICP Assay   | 3132      | 050429       |
|     | Mn                     | EDTA        | 928       | 928          |
|     | Na                     | ICP Assay   | 3152a     | 120715       |
|     | Na                     | Gravimetric |           | See Sec. 4.2 |
|     | Ni                     | ICP Assay   | 3136      | 120619       |
|     | Ni                     | EDTA        | 928       | 928          |
|     | V                      | IC Assay    | 3165      | 160906       |
|     | V                      | EDTA        | 928       | 928          |
|     | Zn                     | ICP Assay   | 3168a     | 120629       |
|     | Zn                     | EDTA        | 928       | 928          |
|     |                        |             |           |              |

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

January 27, 2022

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

| Sealed TCT Bag Open Date:   |  |
|-----------------------------|--|
| · Sealeo TCT Bao Oberi Dale |  |

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

DD9784.



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

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

> Arsenic, Lead, Selenium, Thallium,

500 µg/mL ea: Cadmium

1 000 µg/mL ea:

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

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

Thallium, TI 1 000 ± 7 µg/mL

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

### **Assay Information:**

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

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

### Characterization of CRM/RM by Two or More Methods Characterization of CRM/RM by One Method Certified Value, X<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 www.inorganicventures.com/TCT

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

January 13, 2022

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

### 11.2 Lot Expiration Date

- January 13, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

| Sealed TCT Bag Open Date:   |  |
|-----------------------------|--|
| · Sealeo TCT Bao Oberi Dale |  |

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

20178Ci

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

www.absolutestandards.com



Certified Reference Material CRM

M5810 M5811

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: Description:

58126 051523 Iron (Fe)

R: 01/03/24

Solvent: 21110221 Lot # Nitric Acid

Formulated By:

J. Brans

であるから

5.0%

250.0 

Nitric Acid

Giovanni Esposito

051523

Reviewed By:

Pedro L. Rentas

051523

Purity Uncertainty Assay 0.12 Flask Uncertainty Expanded SDS Information

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

IN346 2302010-500 10000 99.995 0.10 100.0 50.0034 50.0111 10001.5 20.0 7439-89-6

1. Iron (Fe)

Compound

RM#

Number E E

Conc. (µg/mL)

36

Purity (%)

8

Nominal

Nominal Concentration (µg/mL):

NIST Test Number:

**BTUB** 10000

5E-05 Balance Uncertainty

Recommended Storage:

Ambient (20 °C) 051526

**Expiration Date:** 

Weight shown below was diluted to (mL):

5000.1

Uncertainty

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

LD50

SRM

5 mg/m3 orl-rat 7500mg/kg 3126a

70 BO 90

100

m/2->

10

20

30

40

S O

60

1.054

2.0E4

[1] Spectrum No.1 [ 30.763 sec]:58126.D# [Count] [Linear]

1.0E8

200

m/z->

110

120

130

5.0E7

1.0E8-

5.0E7

230 240

250

260

1 of 2

Lot # 051523

T/2->

210

220

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

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

|                      | Sb Sb Ba Ba Ba Ba                            |         |
|----------------------|--|---------|
|                      |  |         |
|                      | 40.02<br>40.02<br>40.02<br>40.02<br>40.02    |         |
|                      | 5 2 5 5 5 5                                  |         |
|                      | 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8        |         |
|                      |  |         |
|                      | Au Ge  |         |
|                      | 40.02<br>40.02<br>40.02<br>40.02<br>40.02    |         |
|                      | # # # # # # # # # # # # # # # # # # #        |         |
|                      | 40.22<br>40.22<br>40.22<br>40.22             | Trace   |
|                      | Man Man Li                                   | Meta    |
| _                    |  | ls Ve   |
| (T) = Tarnet analyta | 0.10<br>0.20<br>0.20                         | rificat |
|                      | N A S R a K X                                | tion t  |
| 1                    | 40.02<br>40.02<br>40.02<br>40.02             | y ICP-  |
|                      | Rb Rb Sc | WS (L   |
|                      | 0850564                                      | /g/m    |
|                      | 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8        | ۲       |
|                      | Se<br>Si<br>Ag<br>Na<br>Sr                   |         |
|                      | 40.02<br>40.02<br>40.02<br>40.02<br>40.02    |         |
|                      |  |         |
|                      | 4000<br>4000<br>4000<br>4000                 | -       |
|                      |  |         |
|                      | 7  |         |
|                      | 4002<br>4002<br>4002<br>4002<br>4002         |         |

(I) = larger analyte

### Physical Characterization:

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

Certified by:

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

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

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



### Certificate of Analysis

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

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-1

Lot Number:

T2-MEB723367

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

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

Iron,

200 μg/mL ea:

Sodium,

Magnesium, Aluminum, Cerium, Selenium,

Thallium,

100 μg/mL ea:

Lead, Calcium,

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

40 μg/mL ea: Chromium,

30 μg/mL ea:

Copper, Boron,

Vanadium,

20 μg/mL ea:

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

7.5 µg/mL ea: Silver

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

**Assay Information:** 

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

Page 4 of 6

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

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

Certified Value, X<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  $u_{char\ i}$ 

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

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

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

N/A

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

August 30, 2022

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

### 11.2 Lot Expiration Date

- August 30, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRMRM can be supported by long term stability studies conducted on properly stored and handled CRMRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

| - Sealed TCT Bag Open Da | te: |
|--------------------------|-----|
|--------------------------|-----|

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

**Paul Gaines** 

Chairman / Senior Technical Director

DD978hi.



### Certificate of Analysis

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

### 1.0 **ACCREDITATION / REGISTRATION**

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-2

Lot Number:

U2-MEB731108

Matrix:

5% (v/v) HNO3

tr. HF

Value / Analyte(s):

200 µg/mL ea:

Silica,

80 µg/mL ea: Antimony, 70 µg/mL ea:

Tin,

40 µg/mL ea: Molybdenum, 20 µg/mL ea:

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

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

Titanium

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

Silica, SIQ2

200.2 ± 1.3 μg/mL

Tin, Sn

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

Titanium, Ti

20.01 ± 0.13 µg/mL

Density:

1.025 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

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

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

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

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

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

X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub>

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

 $u_{char}$  a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/Δ

### 6.0 INTENDED USE

- 6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.
- **6.2** For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale.</u>
  <a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

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

### 7.1 Storage and Handling Recommendations

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

### 11.1 Certification Issue Date

March 17, 2023

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

### 11.2 Lot Expiration Date

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

### 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.

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control 3D978hi.

**Certifying Officer:** 

Paul Gaines
Chairman / Senior Technical I

Chairman / Senior Technical Director

### Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent

Suitable for Mercury Determination (hydroxylammonium chloride)

MY251





Material No.: 2196-01 Batch No.: 0000215387

Manufactured Date: 2018/06/27

Retest Date: 2025/06/25 Revision No: 1

### Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

| Specification | Result  |  |  |
|---------------|---|--|--|
| >= 96.0 %     | 99.1  |  |  |
| Passes Test   | PT  |  |  |
| <= 0.050 %    | 0.017   |  |  |
| <= 0.25       | 0.19  |  |  |
| Passes Test   | PT  |  |  |
| <= 0.005 %    | < 0.003   |  |  |
| <= 5 ppm      | 4   |  |  |
| <= 5 ppm      | < 3   |  |  |
| <= 0.050 ppm  | < 0.005   |  |  |
|               | >= 96.0 % Passes Test <= 0.050 % <= 0.25 Passes Test <= 0.005 % <= 5 ppm <= 5 ppm |  |  |

For Laboratory, Research or Manufacturing Use

Country of Origin:

CN

Packaging Site:

Paris Mfg Ctr & DC



Phillipsburg, NJ 9001:2015, FSSC22000
Paris, KY 9001:2008
Mexico City, Mexico 9001:2008
Gliwice, Poland 9001:2015, 13485:2012
Selangor, Malaysia 9001:2008
Dehradun, India, 9001:2008, 14001:2004, 13485:2003
Mumbai, India, 9001:2015, 17025:2005
Panoli, India 9001:2015

James Tethier
Vice President Global Quality

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

Avantor Performance Materials, LLC

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

### **Absolute Standards, Inc.**

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57034

 Lot Number:
 070221

Description: Selenium (Se)

**Expiration Date:** 070224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

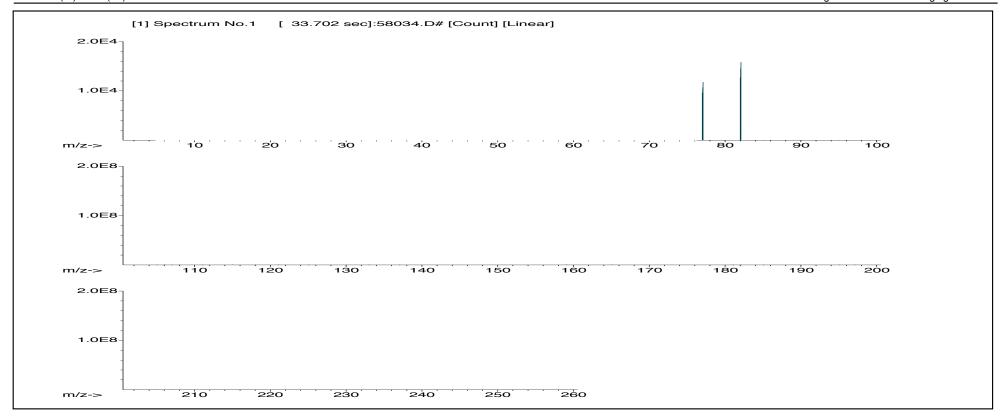
Formulated By: Giovanni Esposito 070221

Lector Denta 070221

Reviewed By: Pedro L. Rentas 070221

**SDS Information** 

|   | Part   | Lot    | Dilution | Initial   | Uncertainty  | Nominal       | Initial       | Final         | Uncertainty | (Solv     | ent Safety Info. On A | Attached pg.)    | NIST |
|---|--------|--------|----------|-----------|--------------|---------------|---------------|---------------|-------------|-----------|-----------------------|------------------|------|
| Compound                                    | Number | Number | Factor   | Vol. (mL) | Pipette (mL) | Conc. (µg/mL) | Conc. (µg/mL) | Conc. (µg/mL) | +/- (μg/mL) | CAS#      | OSHA PEL (TWA)        | LD50             | SRM  |
|   |        |        |          |           |              |               |               |               |             |           |                       |                  |      |
| <ol> <li>Selenium(IV) oxide (Se)</li> </ol> | 58134  | 021621 | 0.1000   | 200.0     | 0.084        | 1000          | 10000.2       | 1000.0        | 2.2         | 7446-08-4 | 0.2 mg/m3             | orl-rat 68 mg/kg | 3149 |



### Certified Reference Material CRM



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

Sn P. Shi

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

|    | Trace Metals Verification by ICP-MS (µg/mL) |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |
|----|---|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| Al | < 0.02                                      | Cd | <0.02  | Dy | <0.02  | Hf | <0.02  | Li | <0.02  | Ni | <0.02  | Pr | <0.02  | Se | T      | Tb | < 0.02 | W  | < 0.02 |
| Sb | < 0.02                                      | Ca | < 0.2  | Er | < 0.02 | Но | < 0.02 | Lu | < 0.02 | Nb | < 0.02 | Re | < 0.02 | Si | < 0.02 | Te | < 0.02 | U  | < 0.02 |
| As | < 0.2                                       | Ce | < 0.02 | Eu | < 0.02 | In | < 0.02 | Mg | < 0.01 | Os | < 0.02 | Rh | < 0.02 | Ag | < 0.02 | Tl | < 0.02 | V  | < 0.02 |
| Ba | < 0.02                                      | Cs | < 0.02 | Gd | < 0.02 | Ir | < 0.02 | Mn | < 0.02 | Pd | < 0.02 | Rb | < 0.02 | Na | < 0.2  | Th | < 0.02 | Yb | < 0.02 |
| Be | < 0.01                                      | Cr | < 0.02 | Ga | < 0.02 | Fe | < 0.2  | Hg | < 0.2  | P  | < 0.02 | Ru | < 0.02 | Sr | < 0.02 | Tm | < 0.02 | Y  | < 0.02 |
| Bi | < 0.02                                      | Co | < 0.02 | Ge | < 0.02 | La | < 0.02 | Mo | < 0.02 | Pt | < 0.02 | Sm | < 0.02 | S  | < 0.02 | Sn | < 0.02 | Zn | < 0.02 |
| В  | < 0.02                                      | Cu | < 0.02 | Au | < 0.02 | Pb | < 0.02 | Nd | < 0.02 | K  | < 0.2  | Sc | < 0.02 | Ta | < 0.02 | Ti | < 0.02 | Zr | < 0.02 |

(T)= Target analyte

Physical Characterization: Certified by:

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

Part # 57034 Lot # 070221 Printed: 8/19/2021, 11:15:02 PM

<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.

<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.

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

### Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 58030

 Lot Number:
 031921

Description: Zinc (Zn)

Part

Expiration Date: 031924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Lot

Formulated By: Giovanni Esposito 031921

Licks Kenta

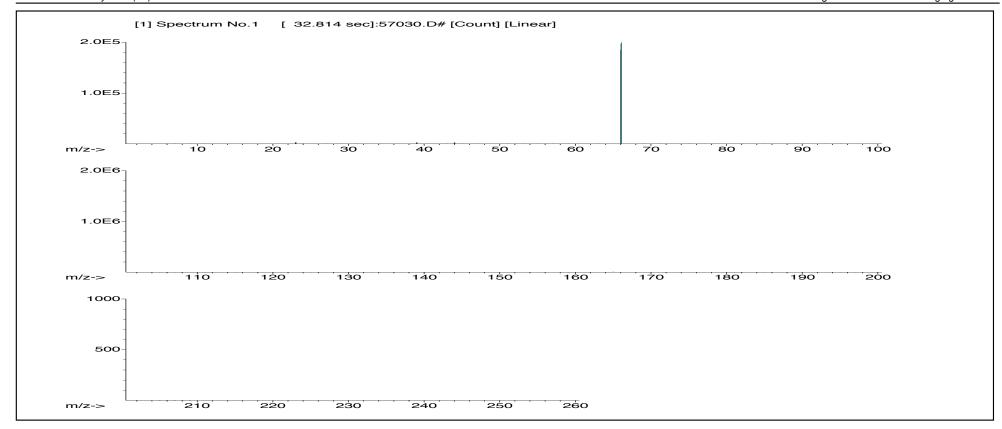
Reviewed By: Pedro L. Rentas 031921

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound OSHA PEL (TWA) SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS# LD50 1000.0 1. Zinc nitrate hexahydrate (Zn) 58130 082020 0.1000 200.0 0.084 1000 10000.3 2.2 10196-18-6 1 mg/m3 orl-rat 1190mg/kg 3168

Nominal



### Certified Reference Material CRM



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

Bn f. Spla

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

|    | Trace Metals Verification by ICP-MS (μg/mL) |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |
|----|---|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| Al | < 0.02                                      | Cd | < 0.02 | Dy | < 0.02 | Hf | < 0.02 | Li | <0.02  | Ni | < 0.02 | Pr | < 0.02 | Se | <0.2   | Tb | <0.02  | W  | < 0.02 |
| Sb | < 0.02                                      | Ca | < 0.2  | Er | < 0.02 | Но | < 0.02 | Lu | < 0.02 | Nb | < 0.02 | Re | < 0.02 | Si | < 0.02 | Te | < 0.02 | U  | < 0.02 |
| As | < 0.2                                       | Ce | < 0.02 | Eu | < 0.02 | In | < 0.02 | Mg | < 0.01 | Os | < 0.02 | Rh | < 0.02 | Ag | < 0.02 | Tl | < 0.02 | V  | < 0.02 |
| Ba | < 0.02                                      | Cs | < 0.02 | Gd | < 0.02 | Ir | < 0.02 | Mn | < 0.02 | Pd | < 0.02 | Rb | < 0.02 | Na | < 0.2  | Th | < 0.02 | Yb | < 0.02 |
| Be | < 0.01                                      | Cr | < 0.02 | Ga | < 0.02 | Fe | < 0.2  | Hg | < 0.2  | P  | < 0.02 | Ru | < 0.02 | Sr | < 0.02 | Tm | < 0.02 | Y  | < 0.02 |
| Bi | < 0.02                                      | Co | < 0.02 | Ge | < 0.02 | La | < 0.02 | Mo | < 0.02 | Pt | < 0.02 | Sm | < 0.02 | S  | < 0.02 | Sn | < 0.02 | Zn | T      |
| В  | < 0.02                                      | Cu | < 0.02 | Au | < 0.02 | Pb | < 0.02 | Nd | < 0.02 | K  | <0.2   | Sc | < 0.02 | Ta | < 0.02 | Ti | < 0.02 | Zr | < 0.02 |

(T)= Target analyte

Physical Characterization: Certified by:

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.

<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.

<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).

 $<sup>\</sup>star$  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).



M4913- 16



### Certificate of Analysis

1 Reagent Lane Fair Lawn, NJ 07410 201.796.7100 tel 201.796.1329 fax

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Thermo Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Products are for research use or further manufacturing. Not for direct administration to humans or animals. It is the responsibility of the final formulator and end user to determine suitability based upon the intended use of the end product. Products are tested to meet the analytical requirements of the noted grade. The following information is the actual analytical results obtained.

| Catalog Number                  | P279                           | Quality Test / Release Date | 01/12/2021 |
|---------------------------------|--------------------------------|-----------------------------|------------|
| Lot Number                      | 210306                         |                             |            |
| Description                     | POTASSIUM PERMANGANATE, A.C.S. |                             |            |
| Country of Origin United States |                                | Suggested Retest Date       | Jan/2026   |

| N/A                 |           |                |                                      |
|---------------------|-----------|----------------|--------------------------------------|
| Result Name         | Units     | Specifications | Test Value                           |
| APPEARANCE          |           | REPORT         | Dark purple to purple green crystals |
| ASSAY               | %         | >= 99          | 99.3                                 |
| CHLORIDE & CHLORATE | %         | <= 0.005       | <0.005                               |
| IDENTIFICATION      | PASS/FAIL | = PASS TEST    | pass test                            |
| INSOLUBLE MATTER    | %         | <= 0.2         | <0.2                                 |
| MERCURY (Hg)        | ppm       | <= 0.05        | <0.004                               |
| SULFATE (SO4)       | %         | <= 0.02        | <0.02                                |

Julian Burton

Julian Burton - Quality Control Manager - Fair Lawn



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 57115 032921

Solvent: 20370011

Nitric Acid

Lot #

2%

Nitric Acid

Formulated By:

Lawrence Barry

032921

Laronce

(mL) 60.0

Description: Phosphorous (P)

Recommended Storage: **Expiration Date:** Ambient (20 °C) 032924

NIST Test Number: **6UTB** 

Nominal Concentration (µg/mL): Weight shown below was 10000 5E-05 Balance Uncertainty

|                 | s diluted to (mL):              | 0                         |
|-----------------|---------------------------------|---------------------------|
|                 | 3000.41                         | •                         |
|                 | 3000.41 0.058 Flask Uncertainty | CE-US Balance Uncertainty |
| Expanded        |                                 | Reviewed By:              |
| SDS Information |                                 | Pedro L. Rentas           |
| •               | 00000                           | 032921                    |

NIST SRM 3186

|      | 1. Ammonium dihydrogen phosphate (P) |                         |                                  | Compound                                 |                         |                 |
|------|--------------------------------------|-------------------------|----------------------------------|--|-------------------------|-----------------|
|      | IN008 PV052018A1                     |                         | Melle                            | RM#                                      |                         |                 |
|      | V052018A1                            |                         | 1                                | Nimber                                   | בסר                     | 2               |
|      | 10000                                |                         | Conc. (July 1111)                | Cone (we/m!)                             | Dillion                 | Nominal         |
|      | 99.999                               |                         | (90)                             | (2)                                      | Purity                  |                 |
|      | 0.10                                 |                         | Punty (%)                        | 2  | Uncertainty Assay       |                 |
|      | 27.3                                 |                         | (%)                              |  | ASSay                   | •               |
|      | 109.9063                             |                         | Weight (g)                       |  | larget                  | •               |
| -    | 109.9093                             |                         | Weight (g)                       |  | Actual                  |                 |
|      | 10000.3                              |                         | ) Conc. (ug/mL) +/- (ug/ml) CAS# |  | Actual                  |                 |
|      | 20.0                                 | ( ) ( ) ( ) ( ) ( ) ( ) | +/- (ua/ml)                      | farmer or and                            | Uncertainty             | exhanged        |
|      | 20.0 7722-76-1                       | 0,101                   | CAS#                             | 1001                                     | (5)                     |                 |
|      | 5 ma/m3                              | (441)                   | OSHA DEL (TWA)                   | (Solvent Salety Hills, Oll Attached bg.) | ant Safaty Info On Atta | SUS INFORMATION |
| LANI | NA<br>A                              | רביטט                   | DEO                              | acried bg.)                              | ached on                | 3               |

| m/z-> | , 2500 | m/z-> | 500 | m/z->          | 2.564 | 5.0€4                                   |
|-------|--------|-------|-----|----------------|-------|---|
|       |        |       |     | •              |       | [1] Spe                                 |
| 210   |        | 110   |     | 0              |       | [1] Spectrum No.1                       |
| 220   |        | 120   |     | N <sub>O</sub> |       |   |
| 8     |        | ā     |     | 30             |       | 12.074                                  |
| 230   |        | 130   |     |                |       | sec]:581                                |
| 240   |        | 140   |     | 6              |       | 15.D#[C                                 |
| 250   |        | 150   |     | 50             |       | [ 12.074 sec]:58115.D# [Count] [Linear] |
| 260   |        | 160   |     | 80             |       | nearj                                   |
| U     |        |       |     |                |       |   |
|       |        | 170   |     | 70             |       |   |
|       |        | 180   |     | 80             |       |   |
|       |        | 190   |     | 90             |       |   |
|       |        | 200   |     |                |       |   |
|       |        | 000   |     | 100            |       |   |



|                     |       | В             | B:      | Be             | Ва    | 1 3        | 2              | Sb       | 2                    |          |                                       |
|---------------------|-------|---------------|---------|----------------|-------|------------|----------------|----------|----------------------|----------|---------------------------------------|
|                     |       | 0.0           | <0.02   | 0.0            | ٥.٥   | 6          | 3              | - A      | 00                   |          |                                       |
|                     |       | _             | _       |                |       |            |                |          |                      |          |                                       |
|                     |       | υ             | င္ပ     | Ω              | S     | 3          | 2 6            | <u>ن</u> | S                    |          |                                       |
|                     |       | <0.02         | 40.02   | <0.02          | <0.02 | <0.02      | 200            | 3        | <0.02                |          |                                       |
|                     |       | Au            | Ge      | Ga             | DQ.   | Eu         | 1              | ų į      | Dγ                   |          |                                       |
|                     |       | <b>∆</b> 0.02 | 40.02   | 40.02          | <0.02 | <0.02      | 20.02          | 3 6      | A)A                  |          |                                       |
|                     |       | Р             | <u></u> | ਸ਼<br>ਜ        | r,    | In         | HO             | : :      | HF                   |          |                                       |
|                     | 1000  | A) 03         | 40.02   | A) 2           | 40.02 | <0.02      | <0.02          | 20.02    | 20.03                | 11900    | 1                                     |
|                     |       | Z :           | Mo de   | H <sub>0</sub> | M     | Mg         | Lu             |          |                      | INCLU    | Note                                  |
|                     | ŀ     |               |         |                |       |            | _              |          | 1                    | V V V    | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ |
| (T)= Target analyte | 20.07 | 000           | 3 6     | 3              | 0.02  | 10.0       | 0.02           | 20.02    | 2                    |          |                                       |
| rget an             | 7     | ۲ ;           | ģ -     | o ;            | P     | ၀ွ         | N <sub>p</sub> | 2        |                      |          |                                       |
| alyte               | 7.03  | 20.02         | 3 -     | 10:00          | 400   | 40.02      | <0.02          | 40.02    |                      | by ICP-I |                                       |
|                     | Sc    | mc            | ? 2     | 7 8            | 5     | Rh         | Re             | 7        |                      | D<br>F   | 5                                     |
|                     | 40.02 | 40.02         | 40.02   | \$0.02         | 3 8   | 8          | A).02          | <0.02    |                      | /g/mL)   |                                       |
|                     | Ta    | · v.          | y,      | . 2            | 3.6   | Ag         | S:             | Se       |                      |          |                                       |
|                     | <0.02 | 40.02         | <0.02   | 8              | 20.02 | 3          | A) (2)         | 402      |                      |          |                                       |
|                     | Ti    | Sn            | Tm      | -              | 1 =   | <b>=</b> ; | <del>,</del>   | 7        |                      |          |                                       |
|                     | <0.02 | <0.02         | 40.02   | <0.02          | 20.02 | 9 9        | A 89           | <0.02    | PARTICIPATION STREET |          |                                       |
|                     | Zr    | Zn            | ×       | 4,4            | <     | ; (        | =              | W        |                      |          |                                       |
|                     | <0.02 | <0.02         | <0.02   | <0.02          | 20.02 | 2002       | 3              | 40.02    |                      |          |                                       |

### 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).



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com M5062 M5063

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Mass Spec Solution

Catalog Number:

MSHG-10PPM

Lot Number:

S2-HG709270

Matrix:

10% (v/v) HCI

Value / Analyte(s):

10 μg/mL ea:

Mercury

Starting Material:

Hg metal

Starting Material Lot#:

1959

Starting Material Purity:

99.9994%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

 $10.001 \pm 0.053 \,\mu g/mL$ 

Density:

1.020 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

| ANALYTE | METHOD     | NIST SRM# | SRM LOT#     |
|---------|------------|-----------|--------------|
| Hg      | ICP Assay  | 3133      | 160921       |
| Hg      | EDTA       | 928       | 928          |
| Ha      | 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:

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

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

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

the variance.

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

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

k = coverage factor = 2

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

u<sub>bb</sub> = 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,  $X_{CRM/RM}$ , 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>)

Xa = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k (u<sup>2</sup>char a + u<sup>2</sup>bb + u<sup>2</sup>lts + u<sup>2</sup>ts) 1/2

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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.

```
O Ag
          0.000011 M Eu <
                            0.000201 O Na
                                              0.000004 M Se <
                                                               0.015915 O Zn <
                                                                                 0.001510
0
   Al
          0.000001 O Fe
                            0.000001 M Nb <
                                              0.000201 O Si
                                                                0.000005 M Zr <
                                                                                 0.000201
M
   As <
          0.000402 M Ga <
                            0.000201 M Nd <
                                              0.000201 M Sm <
                                                               0.000201
M
   Au <
          0.003631 M Gd <
                            0.000201 M Ni <
                                              0.000402 M
                                                        Sn <
                                                               0.001007
M
   B <
          0.001208 M
                    Ge <
                            0.000201 M Os <
                                              0.000605 M
                                                        Sr <
                                                               0.000201
M Ba <
          0.000201 M Hf <
                            0.000201 O P <
                                              0.032370 M
                                                        Ta <
                                                               0.000201
M
  Be <
          0.000201 s
                                   M Pb <
                    Hq <
                                              0.000201 M Tb <
                                                               0.000201
M Bi <
          0.000201 M
                    Ho <
                            0.000201 M Pd <
                                              0.000403 M
                                                        Te <
                                                               0.002216
0
  Ca
          0.000007 M In <
                            0.000201 M Pr <
                                              0.000201 M Th <
                                                               0.000201
M
  Cd <
          0.000201 M Ir
                            0.000201 M
                                      Pt <
                                              0.000402 M Ti <
                                                               0.000402
                                              0.000201 O TI <
M
  Ce <
          0.000201 O K
                            0.000020 M
                                      Rb <
                                                               0.016508
  Co <
M
          0.000201 M La <
                            0.000201 M
                                      Re <
                                              0.000201 M Tm <
                                                               0.000201
  Cr <
0
          0.003021 O Li <
                            0.000107 M
                                      Rh <
                                              0.000201 M U <
                                                               0.008058
M
  Cs <
          0.001208 M Lu <
                            0.000201 M Ru <
                                              0.000201 M V <
                                                               0.000201
M
  Cu <
          0.000402 O
                    Mg
                            0.000001 O
                                      S <
                                             0.053950 M W <
                                                               0.000604
M Dy <
          0.000201 M Mn <
                            0.000604 M Sb <
                                             0.001208 M Y <
                                                               0.000201
M Er <
          0.000201 M Mo
                           0.000009 M Sc <
                                             0.000201 M Yb <
                                                               0.000201
```

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 -** 200.59 +2 4 Hg(OH)(aq) 1+ **Chemical Compatibility -** Stable in HNO3. Avoid basic media forming insoluble carbonate. The sulfide, basic carbonate, oxalate, phosphate, arsenite, arsenate and iodide are insoluble in water.

**Stability -** 2-100 ppb levels not stable in 1% HNO3 / LDPE container, stable in 10% HNO3 packaged in borosilicate glass. 1-100 ppm levels stable in 7% HNO3 packaged in borosilicate glass. 1000-10,000 ppm solutions are chemically stable for years in 5-10% HNO3 / LDPE container.

**Hg Containing Samples (Preparation and Solution) -** Metal (soluble in HNO3); Oxide (Soluble in HNO3); Ores and Organic based (The literature has more references to the preparation of Hg containing samples than any other element. Please consult the literature for your specific sample type, since such preparations are prone to error. Or e-mail our technical staff and we will contact you to discuss your particular sample preparation questions in further detail.).

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 202 amu     | 9 ppt              | n/a   | 186W16O                                     |
| ICP-OES 184.950 nm | 0.03 / 0.005 μg/mL | 1     |   |
| ICP-OES 194.227 nm | 0.03 / 0.005 µg/mL | 1     | V   |
| ICP-OES 253.652 nm | 0.1 / 0.03 µg/mL   | 1     | Ta, Co, Th, Rh, Fe,                         |
|                    |                    |       | U   |

### 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 22, 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 22, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

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

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

Uyen Truong
Supervisor, Product Documentation

Mya Truong

### Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Booth

### Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Laines

### Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



Certified Reference Material CRM

5288



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

**CERTIFIED WEIGHT REPORT:** 

**Part Number:** Lot Number:

58119 071122

Solvent: 20510011 Nitric Acid

**Description:** 

**Expiration Date:** 

Potassium (K)

Ambient (20 °C)

2%

Nitric Acid

40.0

(mL)

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

10000

071125

**NIST Test Number:** 

6UTB

5E-05 Balance Uncertainty

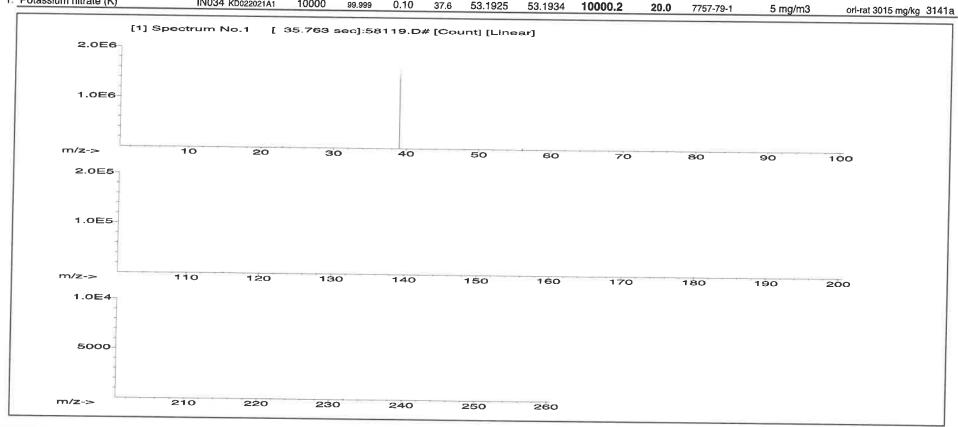
Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

Formulated By: Lawrence Barry 071122 Reviewed By: Pedro L. Rentas 071122

|                          |       | Lat        | Manager       | <b>5</b> |             |      |            |            |               | Expanded    |      | SDS Information         | on          |      |
|--------------------------|-------|------------|---------------|----------|-------------|------|------------|------------|---------------|-------------|------|-------------------------|-------------|------|
| Compound                 | D144  | Lot        | Nominal       |          | Uncertainty | -    | Target     | Actual     | Actual        | Uncertainty | (Sol | vent Safety Info. On At | tached pg.) | NIST |
| - Compound               | RM#   | Number     | Conc. (µg/mL) | (%)      | Purity (%)  | (%)  | Weight (g) | Weight (g) | Conc. (µg/mL) | +/- (µg/mL) | CAS# | OSHA PEL (TWA)          | LD50        | SRM  |
| 1. Potassium nitrate (K) | IN034 | KD022021A1 | 10000         | 99 999   | 0.10        | 37.6 | 52 102E    | E2 1024    | 10000 0       | 00.0        |      |                         |             |      |





### Certified Reference Material CRM



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

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

|    |        |    |        |    |        |    | Trace M | etals | Verifica | atior | by ICP- | MS | (µg/mL) |    |        |        |        |       |        |
|----|--------|----|--------|----|--------|----|---------|-------|----------|-------|---------|----|---------|----|--------|--------|--------|-------|--------|
| Al | <0.02  | Cd | <0.02  | Dy | <0.02  | Hf | <0.02   | Li    | <0.02    | Ni    | <0.02   | Pr | <0.02   | Se | <0.2   | Tb     | <0.02  | W     | <0.02  |
| Sb | < 0.02 | Ca | < 0.2  | Er | < 0.02 | Ho | < 0.02  | Lu    | < 0.02   | Nb    | < 0.02  | Re | < 0.02  | Si | < 0.02 | Te     | < 0.02 | l u l | < 0.02 |
| As | <0.2   | Ce | < 0.02 | Eu | < 0.02 | In | < 0.02  | Mg    | < 0.01   | Os    | < 0.02  | Rh | < 0.02  | Ag | < 0.02 | l ml   | < 0.02 | l v l | < 0.02 |
| Ba | < 0.02 | Cs | < 0.02 | Gd | < 0.02 | lr | < 0.02  | Mn    | < 0.02   | Pd    | < 0.02  | Rb | < 0.02  | Na | < 0.2  | Th     | < 0.02 | Yb    | < 0.02 |
| Be | < 0.01 | Cr | < 0.02 | Ga | < 0.02 | Fe | < 0.2   | Hg    | < 0.2    | P     | < 0.02  | Ru | < 0.02  | Sr | < 0.02 | l Tm l | < 0.02 | Y     | <0.02  |
| Bi | < 0.02 | Co | < 0.02 | Ge | < 0.02 | La | < 0.02  | Mo    | < 0.02   | Pt    | < 0.02  | Sm | < 0.02  | s  | < 0.02 | Sn     | <0.02  | Zn    | <0.02  |
| В  | <0.02  | Cu | <0.02  | Au | <0.02  | Pb | <0.02   | Nd    | <0.02    | K     | T       | Sc | <0.02   | Ta | < 0.02 | Ti     | < 0.02 | Zr    | <0.02  |

(T)= Target analyte

### **Physical Characterization:**

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

Certified by:

But All

- \* 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 # **58119** 

Lot # 071122

2 of 2

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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):

|     |       |   |        |     |  |          | Trace M.          | otolo | Vorifico | 201   | F. CO                                   | 2      |  |     |       |      |       | ı     |       |
|-----|-------|---|--------|-----|--|----------|-------------------|-------|----------|-------|---|--------|--|-----|-------|------|-------|-------|-------|
|     |       |   |        |     |  |          | 1                 | Cars  | ۱^       |       | ייין כו                                 | 20     | ng/mr)   |     |       |      |       |       |       |
|     |       |   |        |     | The state of the s |          | The second second |       |          |       |   |        |  |     |       |      |       | ı     |       |
| I V | <0.02 | ొ | <0.02  | δ   | <0.02  | HF       | <0.02             | ï     | <0.02    | Z     | <0.02                                   | ď      | <0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.0 | 32  | 6     | É    | 89    | 1 487 | 000   |
| Sb  | <0.02 | ű | <0.5   | į.  | 200  | H        | 70.00             | -     | 200      | 11.11 | 000                                     | ,      |  | 3 ; | 1     | 2    | 70.02 | A     | 70.05 |
| A   | 4     | , | 100    | 1 1 | 100  | 2        | 70.00             | 7     | 20:05    | 2     | Z0:0>                                   | 2<br>2 | <b>₹0.02</b>   | 2   | <0.02 | E e  | <0.05 | Þ     | <0.02 |
| AS  | 7.02  | 3 | Z0:02  | 3   | <0.02  | 드        | <0.02             | Ä     | 0.05     | ő     | <0.02                                   | Kh.    | 2002   | Αo  | 2007  | F    | 500   | 7.7   | 5     |
| Ha  | €     | ێ | 2002   | 2   | 0000   | ,1       |                   | >     | 200      | i     |   |        | ***************************************                      | Ď,  | 70:05 | 17   | 70.02 | >     | 70:05 |
|     | ٠.    | 3 | -0.00  | 3   | 7000   | =        | 70.0>             | IMIM  | 70:0>    |       | <0.02                                   | 8      | \$0.05<br>\$0.05   | Z   | 95    | É    | 000   | 5     | 500   |
| Be  | <0.01 | Ö | <0.02  | Sa  | <0.02  | 윤        | 40.2              | He    | <0.2     | ۵     | 2000                                    | Ϋ́     | 2007   | ů   | 60    |      |       | ; ;   | 70.00 |
| B.  | Q (Q) | 2 | 2002   | ď   | 200  | -        | 600               | 2     | 400      | . ,   | *************************************** | 1      | 70'07  | วี  | 70'05 | EI T | Z0:02 | -     | Q.02  |
| i   | 000   | 3 | - N.O. | 3   | 7000   | Š        | 70'0>             | Mo    | Z0:02    | =     | <0.02                                   | Sm     | <b>40.02</b>   | S   | <0.02 | S    | SO 02 | 72    | 2007  |
| 20  | <0.02 | ð | <0.02  | Au  | <b>₹</b> 0005  | <b>P</b> | <0.02             | Ž     | <0.02    | ×     | <0>                                     | Ž,     | 2007   | 5   | 5     | i    | 9 9   | 1     | 70.00 |
|     |       |   |        |     |  |          |                   |       |          |       | 100                                     | 3      | 70.07  | 2   |       | _    |       | -     |       |

Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

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

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

All standard containers are meticulously cleaned prior to use.

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

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

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

Certified Deference Metaric Com

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

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

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

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

| Γ   |  |   |           |             |               | ar]        | [ 9.619 sec]:58103.D# [Count] [Linear] | # [C  | 58103.D                                | sec]:( | _               | No.1              | ctrum | [1] Spectrum No.1 |                      |
|-----|--|---|-----------|-------------|---------------|------------|--|-------|--|--------|-----------------|-------------------|-------|-------------------|----------------------|
| 2   | Byfill 0241 ischi  | 2   |           |             |               |            | 1000                                   |       |  |        |                 |                   |       |                   |                      |
| W   | 0.10 10.0 100.0134 100.0173 10000.4 20.0 7790-69-4 5 mg/m3 oct-24 1428 mg/m NA | 5 ma/m3   | 7790-69-4 | 20.0        | 10000.4       | 100.0173   | 100.0134                               | 10.0  | 0.10                                   | 99.999 | 10000 89.889 0. | IN019 LIZO42018A1 | IN019 |                   | Lithium nitrate (Li) |
| SRM | LD50   | RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 | CAS#      | +/- (ug/mL) | Conc. (ug/mL) | Weight (g) | Weight (g)                             | (%)   | Purity (%)                             | 98     | Conc. (µg/mL)   | Number            | RM#   |                   | Dunodino             |
| L   | Attached oo.)  | (Solvent Safety Info, On Attached on.)  | (Soly     | Uncertainty | Actual        | Actual     | Target                                 | ASSAY | Nominal Punty Uncertainty Assay Target | runty  | Nominal         | 707               | i     |                   | 7                    |
|     | ition  | SDS Information   |           | Expanded    |               |            |  |       |  |        |                 | -                 |       |                   |                      |

| 1.056                                       | 0.0<br>8 | B/2-≻<br>500<br>250 | 20 SO 10 | m/z-> |
|---|----------|---------------------|----------|-------|
| F.O. E. |          | o P                 | 0        | 210   |
| -   |          | ON N                | 0<br>0   | 0 88  |
| 9.619 sec]:58103.D# [Count] [Linear]        |          | 00                  | 130      | 230   |
| 1103. D# [Co                                |          | 0                   | 04       | 240   |
| ount) (Linea                                |          | O un                | 150      | 250   |
| ç   |          | .0<br>.0            | 160      | 090   |
|   |          | 0                   | 170      |       |
|   |          | .o.                 | 180      |       |
|   |          | 0                   | 0 0      |       |
|   |          | 001                 | 800      |       |

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## Certified Reference Material CRM



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

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

|          |       |  |                                      |    |       |    | Trace Ma     | stale  | Varifics     | tion | hy ICD       | MC | ( lm/m/)     |     |              |     |       |             |              |
|----------|-------|--|--------------------------------------|----|-------|----|--------------|--------|--------------|------|--------------|----|--------------|-----|--------------|-----|-------|-------------|--------------|
|          |       | STREET, STREET | THE RESIDENCE OF THE PERSON NAMED IN |    |       | -  | THE PARTY    |        | 2011124      |      | 1            | 2  | (M)          |     |              |     |       |             |              |
| F        | 200   | 3  | 2000                                 | à  | 89    | 30 | 200          | E      | F            | 1    | 88           | 4  |              | I.  | -            |     |       |             |              |
| ŧ :      | 70'05 | 3  | 70.00                                | ŝ  | 70.07 | 1  | 70'05        | 3      | 1            | Z,   | 70.02        | Ħ  | Z0:02        | 3   | <b>Q</b> 7   | 19  | Q 05  | <b>≱</b>    | Ø.02         |
| S        | <0.02 | రి   | 40.2                                 | 山  | <0.02 | H  | <b>40.02</b> | Ē      | <b>40.02</b> | £    | <b>40.02</b> | 2  | <b>Q</b> .02 | SS. | <0.02        | ig. | <0.02 | ח           | <b>40.02</b> |
| As       | ₩.    | ප  | <0.02                                | 뤕  | <0.02 | 편  | Z0.0≥        | Mg     | <0.01        | ő    | <0.02        | AS | <0.02        | Ag  | <0.02        | E   | <0.02 | >           | <b>40.02</b> |
| Ba       | <0.02 | రో   | <0.02                                | පු | <0.02 | 卢  | <0.02        | Mn     | <0.02        | Z    | <b>40.02</b> | 2  | Ø.02         | Z   | 40.2         | É   | 200   | \$          | 200          |
| Be       | <0.01 | ඊ  | <0.02                                | පී | ₹0.02 | B. | <0.2         | 黑      | \$07         | ρ.   | <0.02        | R  | 900          | J.  | <0.02        | ع ا | 800   | <b>&gt;</b> | 200          |
| <u> </u> | <0.02 | රි   | <b>40.02</b>                         | පී | 20:0> | 3  | <0.02        | ₩<br>W | <b>40.02</b> | ठ    | <0.02        | Sm | <0.02        | S   | <b>40.02</b> | 5   | 8     | , E         | 200          |
| В        | <0.02 | ರೆ   | <0.02                                | Au | <0.02 | 2  | <0.02        | P      | <0.02        | 24   | <0.2         | S  | <b>40.02</b> | E   | <0.02        | ï   | 000   | 7 1         | 2000<br>P    |

Physical Characterization:

(T)= Target analyte

Certified by:

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

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

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

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

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

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

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

Part # 57103

955 N R 2 03 /0

Certified Reference Material CRM



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NIST SRM

Z

CERTIFIED WEIGHT REPORT 1. Cerium nitrate hexahydrate (Ce) Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: m/z-> m/z-> m/z-> 2,5E7-5.0E7 1.0E6-2.0E6-5.0EB-NIST Test Number: Expiration Date: Part Number: Description: Lot Number: [1] Spectrum No.1 [ 43.472 sec]:58158.D# [Count] [Linear] 210 10 5 IN146 Z512CEB1 24 061322 Cerlum (Ce) 000 061325 57058 Ambient (20 °C) Number 헏 220 120 20 Conc. (ug/mL) 1000.12 Nominal 9 230 130 30 99.999 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity 3 Uncertainty Assay Purity (%) 0.10 240 140 6 Solvent 22 3 8 20510011 3.04919 Weight (g) Target 250 S O [0] # 150 20.0 (mL) 3.04923 Nitric Acid Weight (g) Conc. (µg/mL) Nitric Acid Actual 260 160 60 1000.0 Actual 170 70 -/- (µg/m) Reviewed By: Formulated By: Uncertainty Expanded 20 10294-41-4 180 8 (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Lawrence Barry OSHA PEL (TWA) SDS information 190 90 ₹ 200 100 **LD50** ₹ 061322 061322

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

| L             | 1 50  | , E           |              | >          | 50     | >     |           | I        |        |
|---------------|-------|---------------|--------------|------------|--------|-------|-----------|----------|--------|
| F             |       | - 10          | <u>p</u>     | 5          | _      | _     |           | ı        |        |
| 20.02         | A0.02 | <b>A</b> 0.01 | 40.02        | 40.2       | 40.02  | €0.02 |           |          |        |
| 8             | ა ზ   | Ω             | ొ            | ర్ట        | ర్జ    | ы     |           |          |        |
| 20.02         | 40.02 | 40.02         | 40.02        | <b>⊢</b> j | 40.2   | <0.02 |           |          |        |
| Ail           | දි    | ୍ଥ            | හි           | 댈          | 罩      | Дy    | 7         |          |        |
| <b>40,102</b> | 40.02 | 40.02         | 40.02        | 40.02      | 40.02  | <0.02 |           |          |        |
| 3             | 2     | त             | 4            | Ħ          | Ж      | Ж     |           |          |        |
| 40.02         | 0.02  | 402           | <0.02        | 40,02      | 40,02  | <0.02 |           | Hace M   | 75555  |
| Nd            | Mo    | Hg            | M            | Mg         | L      | E     |           | CIGIS    | +      |
| 40.02         | 40.02 | 40.2          | 40.02        | 40,01      | △0.02  | <0.02 |           | Vernicar | ころいた   |
| ×             | Þ     | ď             | 2            | Š          | \$     | Z     |           | 1011     | ;<br>; |
| 40.2          | 0.02  | 40.02         | 40.02        | 40.02      | <0.02  | <0.02 | OF STREET | y ICP-M  | : 55 5 |
| Sc            | Sm    | Ru            | 25           | 22         | 20     | Pr    | i         | lug.     |        |
| 40.02         | 40.02 | <0.02         | 40.02        | <0.02      | 40.02  | <0.02 |           | /mL)     |        |
| Ta            | S     | Ş             | N            | Ą          | Si.    | æ     |           |          |        |
| <b>₹0.02</b>  | <0.02 | 40.02         | <b>A</b> 02  | 40.02      | 40.02  | 40.2  |           |          |        |
| 11            | Sn    | Ħ             | 7            | Ħ          | Te     | 4ľ    |           |          |        |
| <0.02         | <0.02 | <0.02         | <0.02        | <0.02      | 40.02  | <0.02 |           |          |        |
| Z             | Zn    | Y             | 44           | ۷          | C      | ¥     |           |          |        |
| 40.02         | 40.02 | 40.02         | <b>∂</b> .02 | <0.02      | \$0.02 | <0.02 |           |          |        |

(T)= Target analyte

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

Physical Characterization:

- \* 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 # 57058

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number:

## Certified Reference Material CRM

7 20 23

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Lot #

Solvent: 20510011 Nitric Acid

2%

40.0 (<u>l</u>

Nitric Acid

Formulated By:

Giovanni Esposito

011623

Pedro L. Rentas

011623

Giovannie

Jacob P

Description: Aluminum (AI)

011623 58113

**Expiration Date:** 011626

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

Weight shown below was diluted to (mL): **NIST Test Number:** 6UTB 2000.02 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By:

Compound ₽ ¥ Number ξ Conc. (µg/mL) Nominal 10000 99.999 Purity Uncertainty Assay 38 Purity (%) 0.10 7.30 8 273.9779 Weight (g) Target 274.0078 Weight (g) Conc. (µg/mL) Actual 10001.1 Actual +/- (µg/mL) Uncertainty Expanded 20.0 7784-27-2 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SDS Information LD50 NIST SRM

1. Aluminum nitrate nonahydrate (Al) IN022 ALM112021A1 m/z-> m/z-> m/z-> 1.0 € 6 2.0 € 6 2.5E6 5.0E6 2.5E5 5.0E5 [1] Spectrum No.1 210 110 0 220 120 20 [ 15.014 sec]:58113.D# [Count] [Linear] 230 130 30 240 140 40 250 150 50 260 160 60 170 0 180 80 190 90 2 mg/m3 200 100 ori-rat 3671 mg/kg 3101a

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

| Compound                  | RM#               | Lot<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]          | 00    | unti (Line           | ari                  |  |                                  |          |   |                       |       |
| 1.0E4                     |                   |                   |                                     |              |  |       |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 0                 | .0                |                                     | 000          | .4   | 40000 | 0                    | 0                    | 2  |                                  | 0        |   | 001                   |       |
| 2.<br>4<br>4              |                   |                   |                                     |              |  |       |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 0                 | 120               |                                     | 90           | 140  |       | 150                  | 160                  | 071  | 0                                | 180      | 190   |                       |       |
| 6.0E4                     |                   |                   |                                     |              |  |       |                      |                      |  |                                  |          |   |                       |       |
| m/z->                     | 019               | 220               |                                     | 230          | 240  |       | 250                  | 260                  |  |                                  |          |   |                       |       |

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

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

(T) = Target analyte

### Physical Characterization:

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



Certified by:

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<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> 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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Certified Reference Material CRM

B

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

Nitric Acid

21110221

Solvent:

Sodium (Na)

Description:

Part Number: Lot Number:

CERTIFIED WEIGHT REPORT:

**Expiration Date:** Recommended Storage:

022123

Lot #

Lawrence Barry Formulated By:

022123

Pedro L. Rentas

022123

Reviewed By:

Nitric Acid 60.0 (mL) % Ambient (20 °C) 022126

10000

Nominal Concentration (µg/mL):

NIST Test Number:

**6UTB** 

5E-05 Balance Uncertainty 0.06 Flask Uncertainty 3000.41 Weight shown below was diluted to (mL):

SIEM SIEM LD50 SDS Information (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) CAS# +/- (mg/ml) Expanded Uncertainty Conc. (ug/mt.) Actual Weight (g) Actual Weight (g) Target Uncertainty Assay 8 Purity (%) Purity (%) Conc. (ug/mL) Nominal Number 5 RM# Compound

orl-rat 3430 mg/kg 3152a 5 mg/m3 7631-99-4 20.0 100001 111.5410 111.5406 26.9 0.10 88.88 10000 IN036 NAV01201511 1. Sodium nitrate (Na)

8.935 sec]:58111.D# [Count] [Linear] [1] Spectrum No.1

100

06

5.0E6 2.5E6

120 110 M/z->

200

190

180

170

160

150

140

130

5.0E6 2.5E6

210 m/z->

Lot # 022123 Part # 58111

260

250

240

230

220

## Certified Reference Material CRM





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

|    |              |    |  |               |       |             | Lace | <b>detals</b> | s Verifica                |               | by ICP-N     | MS (t        | (ng/mL)              |         |               |     |          |         |                     |
|----|--------------|----|--|---------------|-------|-------------|------|---------------|---------------------------|---------------|--------------|--------------|----------------------|---------|---------------|-----|----------|---------|---------------------|
| -  |              |    | STATE STATE OF THE PARTY OF THE | ALC PROPERTY. |       | The same of |      |               | NAME OF PERSONS ASSESSED. | Second Second |              | <b>EZURM</b> | DOMESTICAL PROPERTY. | MICHIGA | HARMAGON WALL | No. |          | Table 1 | THE PERSON NAMED IN |
| 7  | 40.02        | ಶ  | 40.02  | Š             |       | H           | L    | Ľ             | <0.02                     | Z             | <0.02        | 占            | <0.02                | B       | 40.2          | £   | <0.02    | 3       | 40.02               |
| ß  | ₹0.02        | ర  | 97   | ф             |       | 유           |      | 2             | <b>400</b> 2              | ź             | <b>20</b> 0⊅ | 2            | <0.02                | :53     | Ø.02          | မ   | Ø 00     | =       | 90                  |
| As | 402          | ප  | Ø.02   | 超             | _     | ä           |      | Mg            | 100>                      | ඊ             | <0.02        | 뮖            | <0.02                | Ag      | <b>A</b>      | F   | <b>8</b> | >       | 900                 |
| Ba | 40.02        | ථ  | ₹0.02  | 3             | _     | 4           |      | Wn            | <0.02                     | B             | <0.02        | 2            | <0.00                | ž       | į-            | Ę   | 600      | 5       | 100                 |
| æ  | 10:0>        | ඊ  | Z0:0>  | පී            | ₹0.02 | 8           | ₩    | 岩             | Ø2                        | Δ,            | 40.02        | 콥            | <b>40.02</b>         | ķ       | ₹005          | Ę   | 6 6<br>6 | } >     | 7 6                 |
| 五  | ₹0.02        | රි | <0.02  | පී            | _     | _3          |      | Wo            | 40.02                     | 盂             | ₹0,02        | S            | -Z000>               | v.      | 8             | 5   | 8        | , ,     | 100                 |
| B  | <b>₹0.02</b> | ටි | <b>40.02</b>   | Αn            |       | £           |      | Ž             | ₹005                      | ×             | 8            | S            | ₹0.05                | (E      | 800           | F   | 900      | 3 %     | 2 6                 |
|    |              |    |  |               |       |             |      |               |                           |               |              |              |                      |         |               |     |          | 1       | ANOTHER PROPERTY.   |

(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

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### **Absolute Standards, Inc.**

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### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20510011

2.0%



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NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>58029</u> Lot Number: 102622

Description: Copper (Cu)

Expiration Date: 102625

Part

Recommended Storage: Ambient (20 °C)

Nominal Concentration ( $\mu$ g/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Lot

Formulated By: Eli Aliaga 102622

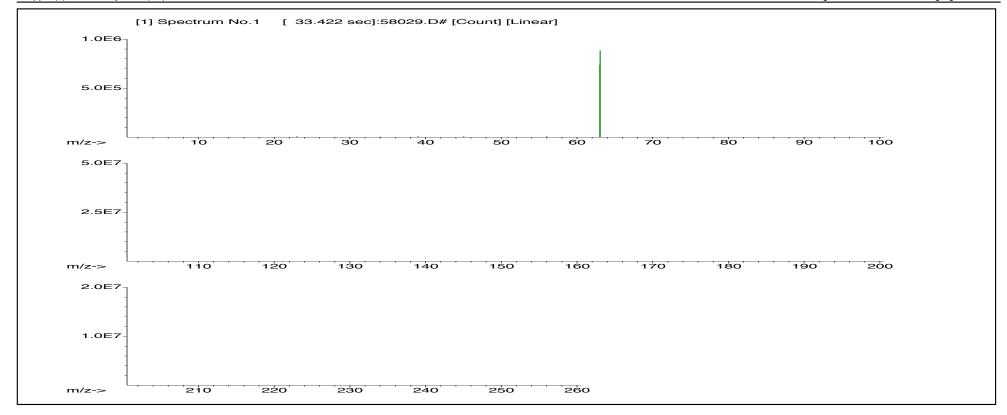
Let Veriewed By: Pedro L. Rentas 102622

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound OSHA PEL (TWA) SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS# LD50 1000.0 1. Copper(II) nitrate trihydrate (Cu) 58129 021422 0.1000 200.0 0.084 1000 10000.8 2.2 10031-43-3 1 mg/m3 orl-rat 794 mg/kg 3114

Nominal



### Certified Reference Material CRM



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

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

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

(T)= Target analyte

Physical Characterization:

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

- \* 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).
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Certified by:

Bur P. All

Part # 58029 Lot # 102622 Printed: 11/7/2022, 11:20:02 PM



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

APPLICATION:

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

**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  $\mu g/L$  (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014

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

Page 1 of 2





RMs ICV 1, 5, 6 SFAM (1)



### 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  $K_3Fe(CN)_6$ , Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

| Element Cor<br>(after | ncentration (µg/L)   |  |
|-----------------------|----------------------|--|
|                       | er 10-fold dilution) | Concentration (µg/L)<br>(after 50-fold dilution) |
| Al                    | 2500                 | 500  |
| Sb                    | 1000                 | 200  |
| As                    | 1000                 | 200  |
| Ва                    | 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                 | 2000   |
| Mg                    | 6000                 | 1200   |
| Mn                    | 520                  | 1200   |
| Ni                    | 530                  | 110  |
| K                     | 9900                 |  |
| Se                    | 1000                 | 2000   |
| Ag                    | 250                  | 200  |
| Na                    | 10000                | 50   |
| Ti                    | 1000                 | 2000   |
| V                     | 500                  | 210  |
| Zn                    | 1000                 | 100<br>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  |

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

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## Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

| m/z->            | N<br>5<br>10 | 5.0E5        | 5.0E5 | m/z->       | 5000 | 1.004 |
|------------------|--------------|--------------|-------|-------------|------|-------|
|                  |              |              |       | 3           |      |       |
| N 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    | 0,01      | <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>     | <b></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     | Sheriff tool   |              |   |
|               | <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 | ~            | ን                | 70        | 굕            | ô            | ₹            | 3     | SHEWNING.  | 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        | <b>△0.02</b> | <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).

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

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CERTIFIED WEIGHT REPORT:

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

57082 100923 Lead (Pb)



Certified Reference Material CRM

MSTHT

R: 12/20/23

Lot #

Solvent: 24002546 Nitric Acid

2% 60.0 Nitric Acid

1000 Ambient (20 °C)

Recommended Storage:

**Expiration Date:** 

100926

Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): **NIST Test Number:** BTU9 3000.41 0.06 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By:

Lot

Nominal

Purity

Uncertainty Assay

**PV#** Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SRM

Formulated By: Lawrence Barry 100923

| Target Actual Actual           |                 | SDS Information                   |
|--------------------------------|-----------------|-----------------------------------|
|                                |                 |                                   |
|                                | a fee incommend | . 02:0 4: 10:10:00                |
| Ī                              |                 |                                   |
|                                |                 |                                   |
|                                |                 |                                   |
|                                |                 |                                   |
| ņ                              |                 |                                   |
| E.                             | expanded        | SPS INDINSTRUCT                   |
| Assay Target Actual Actual Lin |                 | Column Cofety Into On Attacked on |

|       |                   | <u></u>                               |
|-------|-------------------|---------------------------------------|
| 1.005 |                   | 1. Lead(II) nitrate (Pb)              |
|       | [1] Spectrum No.1 | IN029 PBD122016A1                     |
|       | 14.144            | 1000 99.999 0.10 62.5 4.80071 4.80077 |
|       | Sec]:58           | 99.999                                |
|       | 1082.D            | 0.10                                  |
|       | # [Coul           | 62.5                                  |
|       | nti (Line         | 4.80071                               |
| ,     | ar)               | 4.80077                               |
|       |                   | 1000.0                                |
|       |                   | 2.0                                   |
|       |                   | 10099-74-8                            |
|       |                   | 0.05 mg/m3                            |
|       |                   | intryns-rat 93 mg/kg                  |
|       |                   | 3128                                  |
|       |                   |                                       |

| m/z-> | 1.0E6  | ₽.OE6 | m/z-> | 5.0E4 | 1.0∈5 | m/z->      | 5.0M4 | 1.0E5 |
|-------|--|-------|-------|-------|-------|------------|-------|-------|
|       |  |       |       |       |       | ä          |       |       |
| N -   | and property of the second sec |       | 110   |       |       | ō          |       |       |
|       |  |       |       |       |       |            |       |       |
| 022   |  |       | 120   |       |       | N<br>O     |       |       |
| to.   |  |       |       |       |       |            |       |       |
| 200   |  |       | 130   |       |       | 30         |       |       |
| 240   |  |       | 140   |       |       | 40         |       |       |
| Ò     |  |       | Ò     |       |       | 0          |       |       |
| 250   |  |       | 150   |       |       | <b>5</b> 1 |       |       |
|       |  |       |       |       |       | *          |       |       |
| 0     |  |       | 160   |       |       | 00         |       |       |
|       |  |       |       |       |       |            |       |       |
|       |  |       | 170   |       |       | 6          |       |       |
|       |  |       | 180   |       |       | 80         |       |       |
|       |  |       | Ö.    |       |       | o .        |       |       |
|       |  |       | 190   |       |       | 90         |       |       |
|       |  |       |       |       |       |            |       |       |
|       |  |       | 200   |       |       | 00         |       |       |
|       |  |       | 200   |       |       | 100        |       |       |

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

## Physical Characterization:

(1)= Target analyte

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

Certified by:

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

the preparation of all standards.

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

Certified Reference Material CRM



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800-368-1131

Absolute Standards, Inc.

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

|          | 1     | -             |              | -             | -           |             | -        | -            |              | -     | -  |                 | 7        |  | - |
|----------|-------|---------------|--------------|---------------|-------------|-------------|----------|--------------|--------------|-------|--|-----------------|----------|--|---|
|          |       | В             | 10           | <u> </u>      | Be          | Ва          | 1        | As           | 30           | 3     | 2  |                 |          |  |   |
|          |       | 40.02         | 2000         | 5             | <u>8</u>    | 40,02       |          | 40.2         | 70.02        |       | 40.02  |                 |          |  |   |
|          |       | ව             | S            | · ·           | 2           | సి          | . 8      | څ<br>-       | 2            | ,     | 2  |                 |          |  |   |
|          |       | <b>D.02</b>   | <b>40.02</b> |               | 48          | <b>0.02</b> | 20.02    | 3            | <b>4</b> 0.2 | 000   | A  |                 |          |  |   |
|          |       | Αu            | <del>ڇ</del> | Ş             | ₽<br>-      | ይ           | 2        | ľ            | Ę            | 5     | 7  |                 |          |  |   |
|          |       | <b>∆</b> 002  | <0,02        | 20.02         | 3           | A)02        | 20,02    | 3            | A),02        | 70.02 | 2000   |                 |          |  |   |
|          | Ì     | 3             | F            | 17            | <u>F</u>    | F           | ħ        | 7            | 뚱            | 12    | W.   | Service Service |          |  |   |
|          |       | <b>∆</b> 0.02 | 0.02         | , C           | 3           | <u> </u>    | 20.02    | 3            | <u>&amp;</u> | 20.02 | 2000   |                 | Hace in  |  |   |
|          |       | Z.            | ₹            | 200           | 7           | š           | <b>3</b> |              | Ε.           | 5     |  |                 | Jergis   | 1                                      |   |
| 3        |       | <b>A</b>      | &<br>20.02   | 4             | 6.02        | \$          | <u>A</u> |              | A (2)        | 20.02 |  |                 | ARIIIC   | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ |   |
| Target   | r     | <b>7</b>      | 7            | re            | , ;         | Z           | S        | , ;          | <u> </u>     | 2     | ۱  |                 | HODE     |  |   |
| arialvie | 107   | 3             | <b>A</b>     | 40.02         | 20.02       | 3           | 40.02    | 2000         | 3            | Н     |  |                 | DY ICE-P |  |   |
|          | ۶     | 9 -           | î            | R             | 2           | ğ           | <b>Z</b> | 7            | 9            | 7     |  |                 | ₹<br>E   | ,                                      |   |
| •        | 20.02 | 3 6           | A<br>3       | <b>∆</b> 0.02 | 20.02       | 3           | <b>A</b> | 70.02        | 3            | ۵.02  |  | ľ               |          |  |   |
|          | I E   | 3 6           | ^            | ş             | N           | 1 6         | Αg       | 2            | ?            | જ     | The same   |                 |          |  |   |
|          | 20,02 | 68            | 3            | <u>&amp;</u>  | 8           |             | <b>≙</b> | 20.02        | 3            | 40.2  | A STATE OF THE STA |                 |          |  |   |
|          |       | 1 1           | ?            | ď             | П           | :           | -1       | ie.          | 3            | 7     |  |                 |          |  |   |
|          | 40,02 | 20.02         | 3            | <b>40.02</b>  | 40.02       | 6.06        | 3        | 20.02        | 100          | 4000  |  |                 |          |  |   |
|          | 72    | 4             | ₹,           | <u> </u>      | 5           | -           | <        | _            | : :          | W     | Mannager, or   |                 |          |  |   |
|          | <0.02 | 20.02         | 600          | 3             | <b>6002</b> | 20.02       | 3        | <b>∆</b> .02 | 200          | 200   |  |                 |          |  |   |

### Physical Characterization:

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

Certified by:

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

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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.

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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).



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

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

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

|   | [     | 171   | <u></u>   | (22)     | 5>        | Sb       | 5>         |   |               |   |
|---|-------|-------|-----------|----------|-----------|----------|------------|---|---------------|---|
|   | ۴     | . 22. | <u>ਨੰ</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) Si         |   |
|   | <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.
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- \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All Standards should be stored with caps tight and under appropriate laboratory conditions.
- \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



## Certified Reference Material CRM



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

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

24002546 Nitric Acid

2.0% (IE)

Nominal Concentration (µg/mL):

NIST Test Number:

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

(T) = Target analyte

### Physical Characterization:

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

### Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

<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. Ammortium 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                   |           |
|                     | OS EE EE DY   |           |
|                     | 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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Certified Reference Material CRM

R: 02109124





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

|   |        |        |        |           |                | 100  | 10000         | CHICAGO CONTROL CONTRO | URCEI LABILLY | ianioc)    | (Solvent Safety Into, On Attached pg.)  | ttacned pg.)   | 22   |
|---|--------|--------|--------|-----------|----------------|--|---------------|--|---------------|------------|---|--|------|
| Compound  | Number | Number | Factor | Vol. (mL) | Pipette (mL) ( | conc. (ug/mL)  | Conc. (µg/mL) | Conc. (ug/ml.)   | +/- (ng/mL)   | CAS#       | Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) | 1050   | SRM  |
|   |        |        |        |           |                |  |               |  |               |            |   |  |      |
| Cobalt(II) nitrate hexahydrate (Co) 58127 050923 0,1000 200.0 | 58127  | 050923 | 0.1000 |           | 0.084          | 1000   | 10000         | 100001   | 00            | 10008.00.0 | Company CO O  | 200  | 0770 |
|   |        |        |        |           |                |  |               | 2000   | 1             | 0.770.001  | O.UZ IIIgiritis   | STEE SOCIETY OF HIGHER OF HIGHER OF HIGHER OF HIGHER | 3113 |
| (   |        |        |        | 2         |                |  |               |  |               |            |   |  |      |
|   |        |        | 0 770  |           | LA SPOLL NO    | LOS ESTADOS NO CONTRACTOR SECTION TO CONTRAC | F 1           |  |               |            |   |  |      |

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

Lot # 091923

250

240

230

220

010

W/Z->

# Certified Reference Material CRM





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

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

|    |               |    |              |     |                |    | Trace M  | etals            | Verifical   | tion   | by ICP-M      | 4S (F   | g/mL)         |                        |                     |                |       |     |                   |
|----|---------------|----|--------------|-----|----------------|----|--|------------------|---|--------|---------------|---------|---------------|------------------------|---------------------|----------------|-------|-----|-------------------|
| 1  |               |    |              |     |                |    | STREET, STREET | No section lives | ALL DESCRIPTION OF THE PERSON | 10.000 | Market Mark   | MINNSH. | Sanday Marine | NAME OF TAXABLE PARTY. | Service of the last | SECOND STATES  |       | No. | A STATE OF STREET |
| IV | <0.02         | ಶ  | 1            | Š   | 40.02 Dy 40.02 | Ħ  | <0.02  | П                | <0.02   | Z      | <0.02         | Æ       | <0.02         | B                      | <0.2                | £              | <0.02 | M   | <0.02             |
| ౙ  | <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 | 5   | 40.02             |
| As | 40.2          | 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 | >   | ₩ 40.02           |
| 쯃  | <b>40.02</b>  | చ  | <b>40.02</b> | 3   | <b>4002</b>    | ㅂ  | <0.02  | Ma               | <0.02   | 콘      | ₹000          | 2       | 40.02         | N <sub>a</sub>         | 40.2                | Ę              | 20:0> | g,  | Ø.02              |
| 2  | 10.05         | ඊ  | <b>20.02</b> | త్ర | <b>40.02</b>   | હ  | 40.2   | 쁀                | \$ 20   | م      | ₹0.02         | 콥       | <0.02         | Şt                     | <b>40.02</b>        | Tm             | Ø.02  | ٨   | Ø.02              |
| 遥  | <b>40</b> .02 | 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       | <b>₩</b>      | Fee Fee                | <b>40,02</b>        | Ħ              | Ø.02  | Z   | Ø.02              |

(T)= Target analyte

### Physical Characterization:

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



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



Lot # 091923

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

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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

| -z/x->           | 500 | m/z->    | N<br>IN<br>IN | m/z-><br>5.0≣4   | 1.0厘5 | ≥.005                                   |
|------------------|-----|----------|---------------|--|-------|---|
|                  |     |          |               |  |       | 3                                       |
| Ŋ                |     | 110      |               | ō  |       | [] Speatrum No.1                        |
|                  |     |          |               |  |       | Z<br>0.1                                |
| N<br>N<br>N<br>O |     | 120      |               | N.   |       | á                                       |
| 230              |     | 130      |               | 3<br>0   |       | [ 34.433 sec]:57033.D# [Count] [Linear] |
|                  |     | A second |               | er West A best   |       | 90]:570                                 |
| 240              |     | 140      |               | ò  |       | 33.D#                                   |
| N<br>0           |     | -i-      |               | 50   |       | [Count]                                 |
| Ö                |     | 0        |               | 0  |       | [Lines                                  |
| N<br>O           |     | 160      |               | 0.0  |       | ā                                       |
|                  |     |          |               |  |       |   |
|                  |     | 170      |               | 70   |       |   |
|                  |     | 180      |               | 80   |       |   |
|                  |     | -        |               | The state of the s |       |   |
|                  |     | 190      |               | 90   |       |   |
|                  |     | N        |               |  |       |   |
|                  |     | 200      |               | 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                                      |             |   |
|                | 322428  |             |   |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                         | Trace N     |   |
|                | N H M L L   | letals      |   |
| 9              | 40.2<br>40.2<br>40.2<br>40.2<br>40.2                              | Verifica    |   |
| = Target       | M R P B O R R   | E<br>S<br>S |   |
| Target analyte | 40.02<br>40.02<br>40.02<br>40.02                                  | by ICP-N    |   |
|                | S R R R R R   | id) St      |   |
| R              | 4444<br>444<br>444<br>444<br>444<br>444<br>444<br>444<br>444<br>4 | g/mL)       |   |
|                | Ta Sr Na Se   |             |   |
|                | 40.2<br>40.2<br>40.2<br>40.2<br>40.2<br>40.2                      |             |   |
|                | ######################################                            |             |   |
| (e)            | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02                |             |   |
|                | Z Z Y Z < C &   |             |   |
|                | 40.02<br>40.02<br>40.02<br>40.02<br>40.02                         |             |   |

### Physical Characterization:

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

Certified by:



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

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

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

Part # 57033

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## Certified Reference Material CRM

Solvent: MKBQ8597V Ammonium hydroxide

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

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

Part Number: Lot Number: 57005 071123

Description: Boron (B)

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

**Expiration Date:** 

071126

2.0%

Ammonium hydroxide

Formulated By:

Benson Chan

071123

tento

40.0

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

RM#

Number

Purity (%)

3

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

071123

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

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

NIST SRM

Weight (g) Conc. (µg/mL)

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

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

180

190

200

80

90

100

Part # 57005

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

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

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

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

## Physical Characterization:

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

Certified by:

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

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

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

www.absolutestandards.com



### 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 |
|-------------|-------|----------------|-------|------------|------|------|
|             |       |                |       |            |      |      |
| 0           |       | 110            |       | 0          |      |      |
| N<br>N<br>O |       | 120            |       | 20         |      |      |
| 230         |       | 30             |       | <b>9</b> 0 |      |      |
| 240         |       | 140            |       | <b>40</b>  |      |      |
| 250         |       | 150            |       | 50         |      |      |
| 260         |       | 160            |       | 8          |      |      |
|             |       | 170            |       | 70         |      |      |
|             |       | 180            |       | 8.         |      |      |
|             |       | 190            |       | 90         |      |      |
|             |       | 200            |       | 100        |      |      |

Part # 57116

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

|                     | B Be Bs Sb Al  |   |
|---------------------|--|---|
|                     | 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>3<br>2<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3 |   |
|                     | 5242455  |   |
| 1                   | 40.22<br>40.22<br>40.02<br>40.02   |   |
|                     | P P P P P P P P P P P P P P P P P P P  |   |
|                     | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02   |   |
|                     | 3524585  | _ |
|                     | 40,02<br>40,02<br>40,02<br>40,02<br>40,02  |   |
|                     | H <sub>g</sub> M <sub>h</sub>  |   |
| (T)= Tarnet analyte | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02   |   |
| hanaka              | K P P B S Ni   |   |
| Ď                   | by ICP   |   |
|                     | ×  |   |
|                     | (µg/mL)  |   |
|                     | Na Si  | I |
|                     | 40.2<br>40.02<br>40.02<br>40.02<br>40.02<br>7  |   |
|                     | To T   |   |
|                     | 40.02<br>40.02<br>40.02<br>40.02   |   |
|                     | 7 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4  |   |
|                     | 40.00<br>40.00<br>40.00<br>40.00<br>40.00  |   |

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

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

CERTIFIED WEIGHT REPORT: Lot #

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

Formulated By:

Lawrence Barry

091123

Pedro L. Rentas

091123

**SDS** information

rento

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

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

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

Part # 57015

--z/m

210

220

230

240

250

260



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

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

|                | ľ            | В             | <u> </u> | Ħ.               | 뮸             | 200           | Ę,            | 3            |                | ş                                       | 2            | 4              |          |          |
|----------------|--------------|---------------|----------|------------------|---------------|---------------|---------------|--------------|----------------|---|--------------|----------------|----------|----------|
|                |              | A 022         | 20.02    | 3                | -<br>60<br>10 | 70.02         | 3             | 70           |                | <b>A</b>                                | 2002         | 200            |          |          |
|                |              | <u>ნ</u>      | 8        | ,                | <del>Ω</del>  | 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              |          |          |
|                |              | Αu            | Ę        | 1                | ္မ            | 2             | 2             | 달            | 2              | Į,                                      | Ų            | 1              |          |          |
|                |              | 3             | 40.02    |                  | 3             | <b>♦0.02</b>  | )             | 8            | 20.02          | 3                                       | <b>∆</b> .02 |                |          |          |
|                |              | ÿ             | <u>_</u> |                  | ₹1            | 4             |               | <u> </u>     | 0.0            | F .                                     | H            | 1              |          |          |
|                | 2000         | 3             | <u> </u> | 4.4              | 3             | <b>∆</b> 02   |               | <b>6</b> 002 | 20.02          | 3                                       | 40.02        | -              |          | Trace M  |
|                | i de         | ž             | š        | 200              | Ç             | ¥             | 9             | <b>X</b>     | Į,             | •                                       | 5            |                |          | <u>P</u> |
| 3              | 20,02        | 3             | <u>8</u> | 7.03             | 3             | <b>∆</b> 0,02 | 1000          | <u>^</u>     | 40,02          | 2                                       | A 0,02       |                |          | Verifica |
| Target         | ŀ            | 4             | 7        | 7                | ,             | Z             | Ş             | Ş            | S              |   | Z            |                |          | †:<br>   |
| Target analyte | ê            | 9             | A)       | _                |               | 8             | 10:04         | 3            | A0.02          |   | A) (2)       |                | 3        | אי וכפרו |
|                | Se.          | •             | S        | ¥.               | ,             | <b>₽</b>      | 2             | <b>P</b>     | ₽              | :                                       | Ŗ            | Manager Street | F        | 100      |
|                | 40.02        |               | A<br>S   | 40.02            |               | A             | 70.05         | 3            | <u>\$</u> 0.02 | *************************************** | A            |                | g/ IIIL) | 7        |
|                | Ta           | ,             | ^        | ş                |               | Z.            | A             | •            | S              | ş                                       | ß            | SANSON COM     |          |          |
|                | 40.02        | 70.02         | 3        | <b>∆</b> 0,02    | 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).

Sodium Chloride, Crystal BAKER ANALYZED® A.C.S. Reagent







Material No.: 3624-01

Batch No.: 0000281938

Manufactured Date: 2021-06-07

Retest Date: 2026-06-07

Revision No.: 1

### Certificate of Analysis

| Test                                       | Specification | Result      |  |  |
|--|---------------|-------------|--|--|
| Assay (NaCl) (by Ag titrn)                 | ≥ 99.0 %      | 100.0 %     |  |  |
| pH of 5% Solution at 25°C                  | 5.0 - 9.0     | 6.3         |  |  |
| Insoluble Matter                           | ≤ 0.005 %     | 0.003 %     |  |  |
| lodide (I)                                 | ≤ 0.002 %     | < 0.002 %   |  |  |
| Bromide (Br)                               | ≤ 0.01 %      | < 0.01 %    |  |  |
| Chlorate and Nitrate (as NO <sub>3</sub> ) | ≤ 0.003 %     | < 0.001 %   |  |  |
| ACS - Phosphate (PO <sub>4</sub> )         | ≤ 5 ppm       | < 5 ppm     |  |  |
| Sulfate (SO <sub>4</sub> )                 | ≤ 0.004 %     | < 0.004 %   |  |  |
| Barium (Ba)                                | Passes Test   | Passes Test |  |  |
| ACS - Heavy Metals (as Pb)                 | ≤ 5 ppm       | < 5 ppm     |  |  |
| ron (Fe)                                   | ≤ 2 ppm       | < 1 ppm     |  |  |
| Calcium (Ca)                               | ≤ 0.002 %     | < 0.001 %   |  |  |
| Magnesium (Mg)                             | ≤ 0.001 %     | < 0.001 %   |  |  |
| Potassium (K)                              | ≤ 0.005 %     | 0.001 %     |  |  |

For Laboratory, Research, or Manufacturing Use Meets Reagent Specifications for testing USP/NF monographs Country of Origin: USA

Packaging Site: Paris 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

### **ACCREDITATION / REGISTRATION** 1.0

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGY10

Lot Number:

V2-Y740548

Matrix:

2% (v/v) HNO3

Value / Analyte(s):

10 000 µg/mL ea:

Yttrium

Starting Material:

Yttrium Oxide

Starting Material Lot#:

2661 and 06230520YL

Starting Material Purity:

99.9984%

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

**Certified Value:** 

 $10000 \pm 30 \mu g/mL$ 

Density:

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

### **Assay Information:**

Assay Method #1

10011 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #2

9997 ± 50 µg/mL

ICP Assay NIST SRM 3167a Lot Number: 190730

Assay Method #3

9984 ± 31 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

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

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

uts = transport stability standard uncertainty

### - ------

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

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

XCDM/DM = (Xa) (Uchar a)

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

| M | Ag | < | 0.004600 | М | Eu |   | 0.009037 | М | Na |   | 0.086360 | M | Se | < | 0.005200 | M | Zn |   | 0.030125 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| M | Al |   | 0.014862 | 0 | Fe |   | 0.002410 | М | Nb | < | 0.000570 | 0 | Si |   | 0.024100 | 0 | Zr | < | 0.002600 |
| М | As | < | 0.003500 | М | Ga | < | 0.000570 | M | Nd |   | 0.000923 | M | Sm |   | 0.000461 |   |    |   |          |
| М | Au | < | 0.001700 | М | Gd | < | 0.003500 | M | Ni | < | 0.005700 | M | Sn | < | 0.002300 |   |    |   |          |
| 0 | В  |   | 0.002209 | M | Ge | < | 0.005200 | M | Os | < | 0.001200 | M | Sr | < | 0.004600 |   |    |   |          |
| 0 | Ba | < | 0.002500 | M | Hf | < | 0.000570 | n | Р  | < |          | M | Ta | < | 0.000570 |   |    |   |          |
| 0 | Be | < | 0.001400 | М | Hg | < | 0.000570 | M | Pb |   | 0.005020 | M | Tb |   | 0.001044 |   |    |   |          |
| M | Bi | < | 0.003500 | М | Но |   | 0.009037 | М | Pd | < | 0.005100 | М | Te | < | 0.002300 |   |    |   |          |
| 0 | Ca |   | 0.009841 | М | In | < | 0.002300 | M | Pr | < | 0.002300 | М | Th | < | 0.000570 |   |    |   |          |
| M | Cd | < | 0.000570 | М | lr | < | 0.000570 | M | Pt | < | 0.000570 | M | Ti | < | 0.003500 |   |    |   |          |
| M | Ce | < | 0.002300 | 0 | K  |   | 0.018677 | М | Rb | < | 0.000570 | М | TI | < | 0.000570 |   |    |   |          |
| M | Co | < | 0.000570 | M | La |   | 0.000461 | М | Re | < | 0.000570 | М | Tm | < | 0.003500 |   |    |   |          |
| M | Cr | < | 0.004000 | 0 | Li | < | 0.009300 | М | Rh | < | 0.008000 | M | U  | < | 0.000570 |   |    |   |          |
| M | Cs | < | 0.000570 | M | Lu |   | 0.000582 | М | Ru | < | 0.000570 | M | V  |   | 0.001265 |   |    |   |          |
| M | Си |   | 0.002610 | 0 | Mg |   | 0.001486 | n | S  | < |          | M | W  | < | 0.002300 |   |    |   |          |
| М | Dy |   | 0.003815 | M | Mn |   | 0.000582 | М | Sb |   | 0.005422 | S | Υ  | < |          |   |    |   |          |
| M | Er |   | 0.003615 | M | Мо | < | 0.005700 | М | Sc | < | 0.001200 | M | Yb |   | 0.001827 |   |    |   |          |

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

### 6.0 INTENDED USE

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

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

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

### 7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

February 20, 2024

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

### 11.2 Lot Expiration Date

- February 20, 2029
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

| _ | Sealed TCT | Bag Ope | n Date: |  |
|---|------------|---------|---------|--|
|   |            |         |         |  |

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

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

**Uyen Truong Custom Processing Supervisor** 

Mayyand Man Paul R. Laine

### Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director

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

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

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

**\$** 

Certified Reference Material CRM

20

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

Part # 57003 Lot # 062124

1 of 2

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



# Certified Reference Material CRM



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

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

| 40.02<br>40.02                        | A0.02 | 022   | A 3   |          | <0.02  | <0.02 |       |           |   |
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| 40.02                                 | 3     | 40.02 | 40.02 | <0.02    | <0.02  | <0.02 |       |           |   |
| 7                                     | 7     | F.    | 4     | F        | Но     | Н     |       |           |   |
| 3                                     | 40.02 | 40.2  | <0.02 | 40.02    | <0.02  | <0.02 |       | Trace M   |   |
| Z.                                    | Mo    | Hg    | Mn    | Mg       | Li     |       |       | letals    |   |
| <0.02                                 | <0.02 | <0.2  | <0.02 | <0.01    | <0.02  | 1     | 3     | Verifica: | ١ |
| ×                                     | 7     | Þ     | Ы     | os<br>Os | ß      | N     |       | tion      | ١ |
| <0.2                                  | <0.02 | <0.02 | <0.02 | <0.02    | <0.02  | <0.02 | 3     | y ICP-M   | ١ |
| Sc                                    | Sm    | Ru    | Rb    | Rh       | Re     | 7     | T.    | Brl) S    | ۱ |
| <0.02                                 | <0.02 | <0.02 | <0.02 | <0.02    | <0.02  | 20.02 | 200   | /mL)      |   |
| Ta                                    | s     | Sr    | Na    | Ag       | 2      | 9 5   | e     | ı         | ١ |
| <0.02                                 | <0.02 | <0.02 | 40.2  | <0.02    | 20.02  | 6 8 E | A) 3  |           | I |
| 11                                    | Sn    | Tm    | H     | II       | 1 10   | 1     | 7     |           | ١ |
| <0.02                                 | <0.02 | <0.02 | <0.02 | 20.02    | 20.02  | 3     | <0.02 |           |   |
| 12                                    | Zn    | ×     | Ϋ́    | <        | : 0    | 1     | W     |           |   |
| 20.02                                 | 40.02 | <0.02 | <0.02 | 20.02    | 200    | 2000  | <0.02 |           |   |

(T) = Target analyte

## Physical Characterization:

Al Sh As Ba Ba Bi

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

Certified by:

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

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

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

\* Standards are prepared gravimetrically using balances that are calibrated.

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

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

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

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

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

Part # 57003 Lot # 062124

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2 of 2

### Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



### ACCREDITATION / REGISTRATION

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

### PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

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

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

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

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

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

Assay Information:

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

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

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

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

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

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

4.0 TRACEABILITY TO NIST

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

### 4.2 Balance Calibration

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

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

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of ore each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of the 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 > aO M 841200.0

> dN O 322500.0 > N M 862000.0

M - Checked by ICP-MS

Mn < Mg < Li <

> 0H

> 6H

ΉŁ

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

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

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

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

> 6T M 882000.0 > AT M 882000.0

sT M 034450.0 > dT M E70100.0

s 852000.0 M 882000.0

O.000269 O

O.043560 O

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

> II

JS

674000.0 228610.0

892000.0 892000.0

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699630.0

0.001341

892000.0

0.010560

960000'0

960000.0

73260.0 > nZ O 402100.0 038540.0 > nZ O 267400.0

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

7.7 Storage and Handling Recommendations

oM M 882000.0

0.000268 M K 0.000268 M K 0.000268 M K

0.000872 O Fe > 0.008586 M Ga <

O 892000.0

O S37000.0 M 882000.0

M 882000.0

M 603100.0

M 885800.0

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

INTENDED USE

W Et < O Cn <

O B <

IA O

### 4.1 Thermometer Calibration

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

### Page 3 of 4

- Chemical Testing - Accredited / AZLA Certificate Number 863.01

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

- QSR Certificate Number QSR-1034

1.01 ISO 9001 Qualify Management System Registration

### MOITATY STANDARD DOCUMENTATION 0.01

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

This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. The Coth series alongs mirror and the constant and the country of the Coth series alongs mirror and the country of the Coth series alongs mirror and the country of the coth series alongs and the country of the coth series alongs and the coth series along the country of the coth series and the coth series along the coth series along the coth series and the coth series along the coth series along the coth series and the coth series along the coth series along the coth series and the coth series along the coth series along the coth series and the coth series along the coth series along the coth series and the coth series along the coth series along the coth series and the coth series along the coth series along the coth series and the coth series along the coth series along the coth series are considered as a series along the coth series alo

### HOMOGENEITY

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

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

| Ollinger  |           | C INTOTINATION (ICP_OEC n.    | Idoseomeni              |   |
|---|-----------|-------------------------------|-------------------------|---|
| ss radial/axial view):                                      | are given | Estimated D.L. Estimated D.L. | Technique/Line          |   |
| Interferences (Underline 11 )                               | Order     | idq 41                        | ICP-MS 48 amu           |   |
| Interferences (underlined indicates severe) 32S16O, 32S14N, | A/N       | add                           |                         |   |
| 14N160180,  |           |                               |                         |   |
| 14N17N2, 36Ar12C,   |           |                               |                         |   |
| 48Ca, [96X=2  |           |                               |                         |   |
| 7-V001 (no a  |           |                               |                         |   |
| (where X = Zr, Mo,<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-OES 336.121 nm      |   |
| ла, Та, Сг, U<br>М М9 Ω-                                    | 1 1       |                               | F Note: This standar    | ŀ |
| W, Mo, Co   |           | In/gy 4500000 \ cocos-        | nous prepries sur secon | ٠ |
|   |           |                               |                         |   |

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

1:1:1 H2O / HF./ H2SO4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite Volentily), Oxide - Northere are repetation; and sociation; restore (Dissolved by heating in 1737 HZO / HF / HZSO4); Oxide - Northere history (~800EC) 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



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

### M5985 R:6/14/24

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGIN10

Lot Number:

U2-IN729349

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

10 000 μg/mL ea:

Indium

Starting Material:

Indium Metal

Starting Material Lot#:

2511

Starting Material Purity:

99.9995%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

 $10022 \pm 30 \mu g/mL$ 

Density:

1.044 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

Assay Method #1

10021 ± 56 µg/mL

ICP Assay NIST SRM 3124a Lot Number: 110516

Assay Method #2

10035 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

10001 ± 33 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

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

Characterization of CRM/RM by One Method

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

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

| М | Ag | < | 0.000760 | М | Eu | < | 0.000760 | 0 | Na |   | 0.012771 | M | Se | < | 0.023000 | М | Zn | < | 0.006100 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| М | Al |   | 0.003385 | 0 | Fe |   | 0.004462 | М | Nb | < | 0.000760 | 0 | Si |   | 0.024619 | М | Zr | < | 0.000760 |
| М | As | < | 0.004600 | М | Ga | < | 0.000760 | М | Nd | < | 0.000760 | М | Sm | < | 0.000760 |   |    |   |          |
| М | Au | < | 0.002300 | М | Gd | < | 0.000760 | 0 | Ni | < | 0.005100 | М | Sn | < | 0.000760 |   |    |   |          |
| 0 | В  |   | 0.003692 | М | Ge | < | 0.001600 | М | Os | < | 0.000760 | 0 | Sr | < | 0.000610 |   |    |   |          |
| М | Ba | < | 0.001600 | M | Hf | < | 0.000760 | n | Р  | < |          | М | Ta | < | 0.000760 |   |    |   |          |
| 0 | Be | < | 0.000130 | M | Hg | < | 0.003100 | M | Pb |   | 0.001400 | М | Tb | < | 0.000760 |   |    |   |          |
| M | Bi | < | 0.000760 | М | Но | < | 0.000760 | М | Pd | < | 0.001600 | М | Te | < | 0.000760 |   |    |   |          |
| 0 | Ca |   | 0.004616 | 8 | In | < |          | М | Pr | < | 0.000760 | М | Th | < | 0.000760 |   |    |   |          |
| M | Cd | < | 0.000760 | М | lr | < | 0.000760 | M | Pt | < | 0.000760 | 0 | π  | < | 0.001100 |   |    |   |          |
| М | Ce | < | 0.000760 | 0 | K  |   | 0.007078 | М | Rb | < | 0.000760 | М | TI | < | 0.000760 |   |    |   |          |
| М | Co | < | 0.000760 | М | La | < | 0.000760 | М | Re | < | 0.000760 | М | Tm | < | 0.000760 |   |    |   |          |
| 0 | Сг | < | 0.001300 | 0 | Li | < | 0.000130 | М | Rh | < | 0.000760 | М | U  | < | 0.000760 |   |    |   |          |
| М | Cs | < | 0.000760 | M | Lu | < | 0.000760 | М | Ru | < | 0.000760 | М | ٧  | < | 0.001600 |   |    |   |          |
| М | Cu | < | 0.003800 | 0 | Mg |   | 0.000707 | n | S  | < |          | М | W  | < | 0.001600 |   |    |   |          |
| М | Dy | < | 0.000760 | 0 | Mn |   | 0.000149 | M | Sb | < | 0.000760 | М | Υ  | < | 0.000760 |   |    |   |          |
| М | Er | < | 0.000760 | М | Мо | < | 0.002300 | М | Sc | < | 0.000760 | M | Yb | < | 0.000760 |   |    |   |          |
|   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |

n - Not Checked For s - Solution Standard Element

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

i - Spectral Interference

### **INTENDED USE** 6.0

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

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

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

### 7.1 Storage and Handling Recommendations

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

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

February 21, 2023

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

| 0 TOT D 0            | na Datas |  |
|----------------------|----------|--|
| - Sealed TCT Bag Ope | en Date: |  |

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

20178hi

Sulfuric Acid
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis
Low Selenium





Material No.: 9673-33

Batch No.: 23D2462010 Manufactured Date: 2023-03-22

Retest Date: 2028-03-20

Revision No.: 0

### Certificate of Analysis

| Test  | Specification | Result      |
|---|---------------|-------------|
| ACS - Assay (H2SO4)                             | 95.0 - 98.0 % | 96,1 %      |
| Appearance                                      | Passes Test   | Passes Test |
| ACS - Color (APHA)                              | ≤ 10          | 5           |
| ACS – Residue after Ignition                    | ≤ 3 ppm       | < 1 ppm     |
| ACS - Substances Reducing Permanganate (as SO2) | ≤ 2 ppm       | < 2 ppm     |
| Ammonium (NH <sub>4</sub> )                     | ≤ 1 ppm       | 1 ppm       |
| Chloride (CI)                                   | ≤ 0.1 ppm     | < 0.1 ppm   |
| Nitrate (NO₃)                                   | ≤ 0.2 ppm     | < 0.1 ppm   |
| Phosphate (PO4)                                 | ≤ 0.5 ppm     | < 0.1 ppm   |
| Trace Impurities – Aluminum (Al)                | ≤ 30.0 ppb    | < 5.0 ppb   |
| Arsenic and Antimony (as As)                    | ≤ 4.0 ppb     | < 2.0 ppb   |
| Trace Impurities – Boron (B)                    | ≤ 10.0 ppb    | 8.5 ppb     |
| Trace Impurities – Cadmium (Cd)                 | ≤ 2.0 ppb     | < 0.3 ppb   |
| Trace Impurities - Chromium (Cr)                | ≤ 6.0 ppb     | < 0.4 ppb   |
| Trace Impurities - Cobalt (Co)                  | ≤ 0.5 ppb     | < 0.3 ppb   |
| Trace Impurities - Copper (Cu)                  | ≤ 1.0 ppb     | < 0.1 ppb   |
| Trace Impurities - Gold (Au)                    | ≤ 10.0 ppb    | 0.5 ppb     |
| Heavy Metals (as Pb)                            | ≤ 500.0 ppb   | < 100.0 ppb |
| Trace Impurities - Iron (Fe)                    | ≤ 50.0 ppb    | 1.3 ppb     |
| Trace Impurities - Lead (Pb)                    | ≤ 0.5 ppb     | < 0.5 ppb   |
| Trace Impurities - Magnesium (Mg)               | ≤ 7.0 ppb     | 0.8 ppb     |
| Trace Impurities – Manganese (Mn)               | ≤ 1.0 ppb     | < 0.4 ppb   |
| Trace Impurities – Mercury (Hg)                 | ≤ 0.5 ppb     | < 0.1 ppb   |
| Trace Impurities - Nickel (Ni)                  | ≤ 2.0 ppb     | 0.3 ppb     |
| Trace Impurities – Potassium (K)                | ≤ 500.0 ppb   | < 2.0 ppb   |
| Trace Impurities - Selenium (Se)                | ≤ 50.0 ppb    | < 0.1 ppb   |
| Trace Impurities – Silicon (Si)                 | ≤ 100.0 ppb   | 31.5 ppb    |
| Trace Impurities – Silver (Ag)                  | ≤ 1.0 ppb     | < 0.3 ppb   |

>>> Continued on page 2 >>>

Sulfuric Acid
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis
Low Selenium





Material No.: 9673-33 Batch No.: 23D2462010

| Test                              | Specification | Result    |
|-----------------------------------|---------------|-----------|
| Trace Impurities – Sodium (Na)    | ≤ 500.0 ppb   | 5.4 ppb   |
| Trace Impurities – Strontium (Sr) | ≤ 5.0 ppb     | < 0.2 ppb |
| Trace Impurities – Tin (Sn)       | ≤ 5.0 ppb     | < 0.8 ppb |
| Trace Impurities – Zinc (Zn)      | ≤ 5.0 ppb     | 0.4 ppb   |

For Laboratory, Research, or Manufacturing Use

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

### **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:

CHEM-CLP-4

Lot Number:

V2-MEB746172

Matrix:

3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s):

1 000 µg/mL ea:

Boron,

Molybdenum,

Silicon,

Tin,

**Titanium** 

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

**ANALYTE** Boron, B

**CERTIFIED VALUE** 

**ANALYTE** Molybdenum, Mo **CERTIFIED VALUE** 

1 000 ± 5 µg/mL

Silicon, Si

1 000 ± 5 µg/mL 1 000 ± 7 µg/mL

Tin. Sn

1 000 ± 5 µg/ml.

Titanium, Ti

1 000 ± 6 μg/mL

Density:

1.032 g/mL (measured at 20 ± 4 °C)

### **Assav Information:**

| ,       |            |                    |              |
|---------|------------|--------------------|--------------|
| ANALYTE | METHOD     | NIST SRM#          | SRM LOT#     |
| В       | ICP Assay  | 3107               | 190605       |
| В       | Calculated |                    | See Sec. 4.2 |
| Мо      | ICP Assay  | traceable to 3134  | U2-MO739068  |
| Si      | ICP Assay  | Traceable to 3150  | S2-S1702546  |
| Sn      | ICP Assay  | 3161a              | 140917       |
| Ti      | ICP Assay  | traceable to 3162a | T2-TI725816  |
|         |            |                    |              |

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 i with standard uncertainty uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

utts = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

 $X_a = mean$  of Assay Method A with  $u_{char} = the$  standard uncertainty of characterization Method A  $CRM/RM = the standard uncertainty ($^{\pm}$) = U_{CRM/RM} = k \left(u^2_{char} + u^2_{bb} + u^2_{tts} + u^2_{ts}\right)^{\frac{1}{2}} \\ k = coverage factor = 2 \\ u_{char} = the errors from characterization \\ u_{bb} = bottle to bottle homogeneity standard uncertainty \\ u_{lts} = long term stability standard uncertainty (storage) \\ u_{tg} = transport stability standard uncertainty$ 

Characterization of CRM/RM by One Method

is used is the mean of individual results:

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

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization

- 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.lnorganicventures.com/TCT
   HF Note: This standard should not be prepared or stored in glass.

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

August 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

- August 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

- 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 Sains

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director



300 Technology Drive Christiansburg, VA 24073 USA

inorganicventures.com

Certificate of Analysis

M6074

M6075 M6076 M6077

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EXP. 9/6/2029

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CHEM-CLP-4

Lot Number:

V2-MEB746762

Matrix:

3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s):

1 000 µg/mL ea:

Boron,

Molybdenum,

Silicon,

Tin,

Titanium

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Boron, B **CERTIFIED VALUE** 

ANALYTE Molybdenum, Mo **CERTIFIED VALUE** 

1 000 ± 5 μg/mL

Silicon, Si

1 000 ± 5 µg/mL

Tin, Sn

1 000 ± 5 µg/mL

Titanium, Ti

1 000 ± 7 μg/mL

1 000 I 5 pg/mL

1 000 ± 6 µg/mL

Density:

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

### **Assay Information:**

| ANALYTE | METHOD     | NIST SRM#          | SRM LOT#     |
|---------|------------|--------------------|--------------|
| В       | ICP Assay  | 3107               | 190605       |
| В       | Calculated |                    | See Sec. 4.2 |
| Мо      | ICP Assay  | traceable to 3134  | U2-MO739068  |
| Si      | ICP Assay  | Traceable to 3150  | S2-SI702546  |
| Sn      | ICP Assay  | 3161a              | 140917       |
| Ti      | ICP Assay  | traceable to 3162a | T2-TI725816  |
|         |            |                    |              |

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

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

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

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

X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub>

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

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

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

k = coverage factor = 2

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{\frac{1}{2}}$  where  $u_{char}$  i 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>CRW/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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 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.

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

### **INTENDED USE** 6.0

- 6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.
- 6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures Terms and Conditions of Sale. https://www.inorganicventures.com/terms-and-conditions-sale. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

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

### 7.1 Storage and Handling Recommendations

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669,6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

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

### 11.1 Certification Issue Date

September 06, 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

- September 06, 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

| <ul> <li>Sealed TCT</li> </ul> | 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 Sains

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

www.absolutestandards.com

Part Number:

Lot Number:



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

CERTIFIED WEIGHT REPORT:

Formulated By: Diovannie Giovanni Esposito 2 Septe 101124

Pedro L. Rentas

101124

Recommended Storage: **Expiration Date:** Description: 101124

Manganese (Mn)

Ambient (20 °°)

Manganese (20 °°) 1000

Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): **NIST Test Number:** ETUB ត្ត 4000.2 Nominal 0.10 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Actual Actual Reviewed By: Uncertainty Expanded (Solvent Safety Info. On Attached pg.)

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/ml.)

+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM NIST T SDS Information

 Manganese(II) nitrate hydrate (Mn) IN031 MNM082020A1 1000 99.999 0.10 20.8 19.2322 19.2344 1000.1 2<u>.</u>0 15710-66-4 5 mg/m3 orl-rat >300mg/kg 3132

| m/z->       | 5.0E7 | 1.0E8  | 5.0E7 | 1.0E8 | 7-2/2    | N<br>UI | 5. OE6                                  |
|-------------|-------|--------|-------|-------|----------|---------|---|
|             |       |        |       |       |          |         | [1] 88                                  |
| 0           |       | 110    |       |       | 0        |         | [1] Spectrum No.1                       |
|             |       |        | •     |       |          |         | NO.1                                    |
| N<br>N<br>O |       | 120    |       |       | 0        |         | و                                       |
| 230         |       | 100    |       |       | 30       |         | 243                                     |
| ō           |       | Ō      |       |       |          |         | ec]:57(                                 |
| N<br>40     |       | 140    |       |       | 40       |         | [ 34.243 sec]:57025.D# [Count] [Linear] |
|             |       |        |       |       |          |         | Coun                                    |
| N<br>D      |       | 150    |       |       | 6        |         | tj (Line                                |
| N<br>O      |       | 300    |       |       | <b>0</b> |         | 2                                       |
| J           |       | J      |       |       |          |         |   |
|             |       | 170    |       |       | 70       |         |   |
|             |       | -      |       |       | Ó        |         |   |
|             |       | 0      |       |       | 80       |         |   |
|             |       | 90     |       |       | 0        |         |   |
|             |       |        |       |       |          |         |   |
|             |       | N<br>0 | on.   |       | 100      |         |   |



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

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

| Г  |       |     |       |     |       |    | Trace Me | etals    | Verifica | tion | by ICP- | SM           | (µg/mL) |    |       |                |       |    |                  |
|----|-------|-----|-------|-----|-------|----|----------|----------|----------|------|---------|--------------|---------|----|-------|----------------|-------|----|------------------|
| A  | 40.02 | 2   | 40.02 | Dγ  | 40.02 | H  | <0.02    | <u>E</u> | <0.02    | Z    | <0.02   | 꾸            | <0.02   | Se | 40.2  | 1 <del>1</del> | <0.02 | *  | <0.02            |
| dS | <0.02 | ರಿ  | <0.2  | 뎍   | <0.02 | Н  | <0.02    | Ę        | 40.02    | ş    | <0.02   | Re           | <0.02   | ž. | 40.02 | Te             | <0.02 | c  | <0.02            |
| As | 40.2  | င္ပ | 40.02 | 띹   | <0.02 | In | <0.02    | Mg       | 40.01    | 0°   | <0.02   | 쫑            | <0.02   | A  | 8,02  | 1              | <0.02 | <  | 40.02            |
| Ba | 40.02 | ς,  | <0.02 | ନୁ  | 40.02 | F. | 40.02    | Mn       | H        | Pd   | <0.02   | <b>&amp;</b> | 40.02   | Z  | 40,2  | 1              | <0.02 | 충  | <b>&lt;</b> 0.02 |
| Ве | 40.01 | ប៉  | 40.02 | ဂ္ဘ | 40.02 | 7, | 40.2     | Hg       | 40.2     | Þ    | <0.02   | Ru           | 40.02   | Sr | 0.02  | Tm             | <0.02 | ×  | <0.02            |
| Bi | 0.02  | ဝ   | <0.02 | ନ୍ମ | 40.02 | La | <0.02    | Mo       | 40.02    | 7    | 40.02   | Sm           | <0.02   | S  | A.02  | Sn             | <0.02 | Zn | <b>60.02</b>     |
| B  | <0.02 | Cu  | <0.02 | Au  | <0.02 | Pb | <0.02    | Nd       | <0.02    | ×    | 40.2    | S            | <0.02   | Ta | 40.02 | 크              | <0.02 | Zr | <0.02            |
|    |       |     |       |     |       |    |          |          | }        |      |         |              |         |    |       |                |       |    |                  |

(T) = Target analyte

# Physical Characterization:

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

### Certified by:

Jon 7 Mills

- \* 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 certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All standards should be stored with caps tight and under appropriate laboratory conditions.
- \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M6137

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGSI1

Lot Number:

V2-SI744713

Matrix:

tr. HNO3

tr. HF

Value / Analyte(s):

1 000 µg/mL ea:

Silicon

Starting Material:

Silica

Starting Material Lot#:

1771

Starting Material Purity:

99.9981%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

999 ± 6 µg/mL

Density:

1.003 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

Assay Method #1

999 ± 5 µg/mL

ICP Assay NIST SRM Traceable to 3150 Lot Number: S2-Si702546

Assay Method #2

1000 ± 7 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

 $\mathbf{X_i}$  = mean of Assay Method  $\mathbf{i}$  with standard uncertainty  $\mathbf{u}_{char}$   $\mathbf{i}$  $\mathbf{w}_{i}$  = the weighting factors for each method calculated using the inverse square of the variance:

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

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

k = coverage factor = 2

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

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

X, = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

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.

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

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

| M | Ag | < | 0.000310 | M | Eu | < | 0.000310 | 0 | Na |   | 0.001656 | M | Se | < | 0.022000 | М | Zn | < | 0.002500 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| M | Al |   | 0.010787 | M | Fe | < | 0.027000 | M | Nb | < | 0.001300 | s | Si | < |          | 0 | Zr | < | 0.001900 |
| М | As | < | 0.001900 | М | Ga | < | 0.001300 | M | Nd | < | 0.000310 | М | Sm | < | 0.000310 |   |    |   |          |
| М | Au | < | 0.000910 | М | Gd | < | 0.000310 | M | Ni | < | 0.005500 | М | Sn |   | 0.000096 |   |    |   |          |
| M | В  |   | 0.016180 | M | Ge | < | 0.001900 | M | Os | < | 0.000610 | 0 | Sr |   | 0.000092 |   |    |   |          |
| M | Ba |   | 0.000096 | M | Hf |   | 0.000423 | i | Р  | < |          | M | Ta |   | 0.002542 |   |    |   |          |
| 0 | Be | < | 0.000570 | M | Hg | < | 0.000610 | M | Pb | < | 0.000310 | М | Tb | < | 0.000310 |   |    |   |          |
| M | Bi | < | 0.000310 | М | Но | < | 0.000610 | М | Pd | < | 0.000610 | M | Te | < | 0.000910 |   |    |   |          |
| 0 | Ca |   | 0.011557 | M | ln | < | 0.000310 | M | Pr | < | 0.000310 | M | Th | < | 0.001900 |   |    |   |          |
| M | Cd | < | 0.000310 | M | lr | < | 0.000310 | M | Pt | < | 0.000310 | М | Ti |   | 0.001078 |   |    |   |          |
| M | Ce | < | 0.000610 | 0 | K  |   | 0.000577 | M | Rb | < | 0.009100 | М | TI | < | 0.000310 |   |    |   |          |
| M | Co | < | 0.001600 | M | La | < | 0.000310 | M | Re | < | 0.000310 | М | Tm | < | 0.000310 |   |    |   |          |
| М | Cr | < | 0.010000 | 0 | Li | < | 0.000460 | М | Rh | < | 0.000310 | М | U  | < | 0.000310 |   |    |   |          |
| М | Cs | < | 0.000310 | M | Lu | < | 0.000310 | M | Ru | < | 0.000310 | 0 | V  | < | 0.001300 |   |    |   |          |
| М | Cu | < | 0.002500 | 0 | Mg |   | 0.001348 | 0 | S  | < | 0.570000 | М | W  | < | 0.001900 |   |    |   |          |
| М | Dу | < | 0.000310 | М | Mn | < | 0.002500 | M | Sb | < | 0.000310 | M | Υ  | < | 0.000310 |   |    |   |          |
| M | Er | < | 0.000310 | M | Мо | < | 0.000310 | 0 | Sc | < | 0.000590 | M | Yb | < | 0.000310 |   |    |   |          |
|   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |

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

### 6.0 **INTENDED USE**

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

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

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

### 7.1 Storage and Handling Recommendations

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

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

Atomic Welght; Valence; Coordination Number; Chemical Form in Solution - 28.09 +4 6 Si(OH)x(F)y2-Chemical Compatibility -Soluble in HCl, HF, H3PO4 H2SO4 and HNO3 as the Si(OH)x(F)y2-. Avoid neutral to basic 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 silicic acid (silicic acid is soluble up to ∼100 ppm in water) in all dilute acids

Stability - 2-100 ppb levels - stability unknown - (alone or mixed with all other metals) as the Si(OH)x(F)y2-. 1-10,000 ppm single element solutions as the Si(OH)x(F)y2- chemically stable for years in 2-5 % HNO3 / trace HF in a LDPE container.

Si Containing Samples (Preparation and Solution) -Metal (Soluble in 1:1:1 H2O / HF / HNO3); Oxide - SiO2, amorphic (dissolve by heating in 1:1:1 H2O / HF / HNO3); Oxide - quartz (fuse in Pt0 with Na2CO3); Geological Samples(fuse in Pt0with Na2CO3 followed by HCI solution of the fuseate); Organic Matrices containing silicates and non volatile silicon compounds (dry ash at 4500C in Pt0 and dissolve by gently warming with 1:1:1 H2O / HF / H2SO4 or fuse / ash with Na2CO3 and dissolve fuseate with HCI / H2O); Silicone Oils - dimethyl silicones depolymerize to form volatile monomer units when heated (Measure directly in alcoholic KOH / xylene mixture where sample is treated first with the KOH at 60-1000C to "unzip" the Si- O-Si polymeric structure or digest with conc. H2SO4 / H2O2 followed by cooling and dissolution of the dehydrated silica with HF.) Note that the direct analysis of silicone oils in an organic solvent will result in false high results due to high vapor pressure of volatile monomer units like hexamethylcyclotrisiloxane. The KOH forms the K2+Si(CH3)2O= salt which is not volatile at room temperature.

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 28 amu      | 4000 - 8000 ppt   | N/A   | N2, 12C16O                                  |
| ICP-OES 212.412 nm | 0.02/0.01 µg/mL   | 1     | Hf, Os, Mo, Ta                              |
| ICP-OES 251.611 nm | 0.012/0.003 µg/mL | 1     | Ta, U, Zn, Th                               |
| ICP-OES 288.158 nm | 0.03/0.004 µg/mL  | 1     | Ta, Ce, Cr, Cd, Th                          |

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### **QUALITY STANDARD DOCUMENTATION** 10.0

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

### 11.1 Certification Issue Date

July 10, 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

- July 10, 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

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

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

**Uyen Truong** Custom Processing Supervisor

Mayyand Man
Paul R. Laine

### Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director



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

R: 4/20/21

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

\* M6150

**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 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

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

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### 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>8</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                                      | SPILE/  | ICV6-0400                                      |
|---------|--|---------|--|
| Element | Concentration (µg/L) (after 100-fold dilution) | Analyte | Concentration (µg/L) (after 100-fold dilution) |
| Hg      | 4.0  | CN-     | 99   |

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





M6151

R-> 1/15/25

Material No.: 9530-33

Batch No.: 22G2862015 Manufactured Date: 2022-06-15

Retest Date: 2027-06-14

Revision No.: 0

### Certificate of Analysis

| Test                                      | Specification         | Result      |
|---|-----------------------|-------------|
| ACS - Assay (as HCI) (by acid-base titrn) | 36.5 - 38.0 %         |             |
| ACS - Color (APHA)                        | 50.5 - 36.0 %<br>≤ 10 | 37.9 %      |
| ACS - Residue after Ignition              | ≤ 3 ppm               | 5           |
| ACS - Specific Gravity at 60°/60°F        |                       | < 1 ppm     |
| ACS – Bromide (Br)                        | 1.185 - 1.192         | 1.191       |
| ACS - Extractable Organic Substances      | ≤ 0.005 %             | < 0.005 %   |
| ACS - Free Chlorine (as Cl2)              | ≤ 5 ppm               | < 1 ppm     |
| Phosphate (PO <sub>4</sub> )              | ≤ 0.5 ppm             | < 0.5 ppm   |
| Sulfate (SO <sub>4</sub> )                | ≤ 0.05 ppm            | < 0.03 ppm  |
| Sulfite (SO₃)                             | ≤ 0.5 ppm             | < 0.3 ppm   |
| Ammonium (NH <sub>4</sub> )               | ≤ 0.8 ppm             | 0.3 ppm     |
| Trace Impurities - Arsenic (As)           | ≤ 3 ppm               | < 1 ppm     |
| Trace Impurities - Aluminum (AI)          | ≤ 0.010 ppm           | < 0.003 ppm |
| Arsenic and Antimony (as As)              | ≤ 10.0 ppb            | 1.3 ppb     |
| Trace Impurities - Barium (Ba)            | ≤ 5.0 ppb             | < 3.0 ppb   |
| Trace Impurities - Beryllium (Be)         | ≤ 1.0 ppb             | 0.2 ppb     |
| Trace Impurities - Bismuth (Bi)           | ≤ 1.0 ppb             | < 0.2 ppb   |
| Trace Impurities – Boron (B)              | ≤ 10.0 ppb            | < 1.0 ppb   |
| Trace Impurities - Cadmium (Cd)           | ≤ 20.0 ppb            | < 5.0 ppb   |
| Trace Impurities - Calcium (Ca)           | ≤ 1.0 ppb             | < 0.3 ppb   |
|   | ≤ 50.0 ppb            | 163.0 ppb   |
| Trace Impurities - Chromium (Cr)          | ≤ 1.0 ppb             | 0.7 ppb     |
| Trace Impurities - Cobalt (Co)            | ≤ 1.0 ppb             | < 0.3 ppb   |
| Trace Impurities - Copper (Cu)            | ≤ 1.0 ppb             | < 0.1 ppb   |
| Trace Impurities – Gallium (Ga)           | ≤ 1.0 ppb             | < 0.2 ppb   |
| Frace Impurities – Germanium (Ge)         | ≤ 3.0 ppb             | < 2.0 ppb   |
| Frace Impurities – Gold (Au)              | ≤ 4.0 ppb             | 0.6 ppb     |
| Heavy Metals (as Pb)                      | ≤ 100 ppb             | < 50 ppb    |
| Frace Impurities – Iron (Fe)              | ≤ 15 ppb              | 6 ppb       |

>>> Continued on page 2 >>>

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





Material No.: 9530-33 Batch No.: 22G2862015

| Test   | Specification | Result     |
|--|---------------|------------|
| Trace Impurities – Lead (Pb)                           | ≤ 1.0 ppb     | < 0.5 ppb  |
| Trace Impurities - Lithium (Li)                        | ≤ 1.0 ppb     | < 0.2 ppb  |
| Trace Impurities – Magnesium (Mg)                      | ≤ 10.0 ppb    | 2.9 ppb    |
| Trace Impurities - Manganese (Mn)                      | ≤ 1.0 ppb     | < 0.4 ppb  |
| Trace Impurities – Mercury (Hg)                        | ≤ 0.5 ppb     | 0.1 ppb    |
| Trace Impurities – Molybdenum (Mo)                     | ≤ 10.0 ppb    | < 3.0 ppb  |
| Trace Impurities - Nickel (Ni)                         | ≤ 4.0 ppb     | < 0.3 ppb  |
| Trace Impurities - Niobium (Nb)                        | ≤ 1.0 ppb     | 0.8 ppb    |
| Trace Impurities - Potassium (K)                       | ≤ 9.0 ppb     | < 2.0 ppb  |
| Trace Impurities - Selenium (Se), For Information Only |               | < 1.0 ppb  |
| Trace Impurities - Silicon (Si)                        | ≤ 100.0 ppb   | < 10.0 ppb |
| Trace Impurities - Silver (Ag)                         | ≤ 1.0 ppb     | 0.5 ppb    |
| Trace Impurities – Sodium (Na)                         | ≤ 100.0 ppb   | 2.3 ppb    |
| Trace Impurities – Strontium (Sr)                      | ≤ 1.0 ppb     | < 0.2 ppb  |
| Trace Impurities – Tantalum (Ta)                       | ≤ 1.0 ppb     | 1.6 ppb    |
| Trace Impurities – Thallium (TI)                       | ≤ 5.0 ppb     | < 2.0 ppb  |
| Trace Impurities – Tin (Sn)                            | ≤ 5.0 ppb     | 4.0 ppb    |
| Trace Impurities – Titanium (Ti)                       | ≤ 1.0 ppb     | 1.5 ppb    |
| Trace Impurities – Vanadium (V)                        | ≤ 1.0 ppb     | < 0.2 ppb  |
| Trace Impurities – Zinc (Zn)                           | ≤ 5.0 ppb     | 0.8 ppb    |
| Frace Impurities – Zirconium (Zr)                      | ≤ 1.0 ppb     | 0.3 ppb    |

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





Material No.: 9530-33 Batch No.: 22G2862015

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



### Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



M6156

### Certified Reference Material CRM

R > 6/12/24

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

**CERTIFIED WEIGHT REPORT:** Lot # Solvent: Part Number: 57042 MKBQ8597V Ammonium hydroxide Lot Number: 032123 Description: Molybdenum (Mo) 0.5% 15.0 Formulated By: Lawrence Barry 032123 Ammonium hydroxide **Expiration Date:** 032126 (mL) **Recommended Storage:** Ambient (20 °C) Nominal Concentration (µg/mL): 1000 **NIST Test Number: 6UTB** 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas 032123 Volume shown below was diluted to (mL): 3000.41 0.058 Flask Uncertainty **SDS Information** Expanded Part Lot Dilution Initial Uncertainty Nominal Initial Final Uncertainty (Solvent Safety Info. On Attached pg.) NIST Compound Vol. (mL) Pipette (mL) Conc. (µg/mL) CAS# OSHA PEL (TWA) . Number Number Factor Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) SRM 1. Ammonium molybdate (Mo) 58142 1000.0 112322 0.1000 300.0 0.084 1000 10001.4 5 mg(Mo)/m3 2.1 13106-76-8 orl-rat 333 mg/kg 3134 [1] Spectrum No.1 [ 8.594 sec]:57042.D# [Count] [Linear] 2.0E5 1.0E5 m/z->10 20 30 40 50 60 70 80 90 100 2000 1000 m/z->110 120 130 140 150 160 170 180 190 200 2.0E6 1.0E6  $m/z \rightarrow$ 210 220 230 240 250 260



### 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 | Verifica | tion | by ICP-M | S (µ | g/mL) |    |       |    |        |    |       |
|----|-------|----|-------|----|-------|----|---------|-------|----------|------|----------|------|-------|----|-------|----|--------|----|-------|
| Al | <0.02 | Cd | <0.02 | Dy | <0.02 | Hf | <0.02   | Li    | <0.02    | Ni   | <0.02    | Pr   | <0.02 | Se | <0.2  | Tb | <0.02  | W  | <0.02 |
| Sb | <0.02 | Ca | <0.2  | Er | <0.02 | Но | <0.02   | Lu    | <0.02    | Nb   | <0.02    | Re   | <0.02 | Si | <0.02 | Te | < 0.02 | U  | <0.02 |
| As | <0.2  | Ce | <0.02 | Eu | <0.02 | In | <0.02   | Mg    | <0.01    | Os   | <0.02    | Rh   | <0.02 | Ag | <0.02 | Tl | < 0.02 | V  | <0.02 |
| Ba | <0.02 | Cs | <0.02 | Gd | <0.02 | Ir | < 0.02  | Mn    | <0.02    | Pd   | <0.02    | Rb   | <0.02 | Na | <0.2  | Th | < 0.02 | Yb | <0.02 |
| Be | <0.01 | Cr | <0.02 | Ga | <0.02 | Fe | <0.2    | Hg    | <0.2     | P    | <0.02    | Ru   | <0.02 | Sr | <0.02 | Tm | < 0.02 | Y  | <0.02 |
| Bi | <0.02 | Co | <0.02 | Ge | <0.02 | La | <0.02   | Mo    | T        | Pt   | <0.02    | Sm   | <0.02 | S  | <0.02 | Sn | < 0.02 | Zn | <0.02 |
| В  | <0.02 | Cu | <0.02 | Au | <0.02 | Pb | <0.02   | Nd    | <0.02    | K    | <0.2     | Sc   | <0.02 | Ta | <0.02 | Ti | <0.02  | Zr | <0.02 |

(T)= Target analyte

### **Physical Characterization:**

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

Certified by:

- \* 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).





R-02/02/2025

M-6158

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

Manufactured Date: 2024-03-26

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

### Certificate of Analysis

| Assay (HNOs) Appearance Appearance Appearance Passes Test Passes Test Passes Test Color (APHA) Residue after Ignition Chloride (Cl) Phosphate (POa) Sulfate (SOa) Sulfate (SOa) Sulfate (SOa) Arsenic and Antimony (as As) Arsenic in and Antimony (as As) Arsenic and Antimony (as As) Arsenic and Antimony (as As) Arsenic and Interest Bairum (Ba) Arace Impurities - Beryllium (Ba) Arace Impurities - Beryllium (Ba) Arace Impurities - Boron (B) Arace Impurities - Cadmium (Cd) Arace Impurities - Cadmium (Cd) Arace Impurities - Calcium (Ca) Arace Impurities - Calcium (Ca) Arace Impurities - Calcium (Ca) Arace Impurities - Color (Co) Arace Impurities - Calcium (Ca) Arace Impurities - Color (Cu) Arace Impurities - Color (Cu) Arace Impurities - Color (Cu) Arace Impurities - Color (Au) Arace Impurities - Color (Au) Arace Impurities - Color (Au) Arace Impurities - Lead (Pb) Arace Impurities - Lithium (Li) Arace Impurities - Manganese (Mn) Arace Impurities - Nickel (Ni) Arace Impurities - Manganese (Mn) Arace Impurities - Nickel (Ni) Arace Impurities - Manganese (Mn) Arace Impurities - Nickel (Ni) Ar                                  | Test                             | Specification | Result     |
|---|----------------------------------|---------------|------------|
| Appearance Color (APHA)  Residue after Ignition  Chloride (Cl)  Phosphate (POa)  Sulfate (SOa)  Trace Impurities - Barium (Ba)  Trace Impurities - Cobalt (Co)  Trace Impurities - Lead (Pb)  Trace Impur                                   | Assay (HNO3)                     |               |            |
| Second Capera   | Appearance                       |               |            |
| Residue after Ignition  | Color (APHA)                     |               |            |
| Chloride (Cf)  Phosphate (PO <sub>4</sub> )  Sulfate (SO <sub>4</sub> )  Sulfate (SO <sub>4</sub> )  Trace Impurities – Aluminum (AI)  Arsenic and Antimony (as As)  Trace Impurities – Beryllium (Ba)  Trace Impurities – Beryllium (Be)  Trace Impurities – Beryllium (Be)  Trace Impurities – Boron (B)  Trace Impurities – Cadrium (Cd)  Trace Impurities – Cadrium (Cd)  Trace Impurities – Cadrium (Ca)  Trace Impurities – Cadrium (Ca)  Trace Impurities – Cobalt (Co)  Trace Impurities – Cobalt (Co)  Trace Impurities – Cobalt (Co)  Trace Impurities – Copper (Cu)  Trace Impurities – Gallium (Ga)  Trace Impurities – Gold (Au)  Expression of (A | Residue after Ignition           |               | 5          |
| Phosphate (PO <sub>4</sub> )         ≤ 0.10 ppm         < 0.03 ppm  | Chloride (CI)                    |               | 1 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 < 1.0 ppb  Trace Impurities - Chromium (Cr) < 30.0 ppb < 1.0 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 - Gold (Au) < 20 ppb < 10 ppb  Trace Impurities - Gold (Au) < 20 ppb < 100 ppb  Trace Impurities - Lithium (E) < 10.0 ppb < 1.0 ppb  Trace Impurities - Lithium (Li) < 10.0 ppb < 1.0 ppb  Trace Impurities - Lithium (Li) < 10.0 ppb < 1.0 ppb  Trace Impurities - Lithium (Li) < 10.0 ppb < 1.0 ppb  Trace Impurities - Mangaese (Mn) < 10.0 ppb < 1.0 ppb   | Phosphate (PO <sub>4</sub> )     |               | < 0.03 ppm |
| Trace Impurities - Aluminum (AI)       ≤ 40.0 ppb       < 1.0 ppb   | Sulfate (SO <sub>4</sub> )       | • •           | < 0.03 ppm |
| Arsenic and Antimony (as As)  | Trace Impurities - Aluminum (AI) |               |            |
| Trace Impurities - Barium (Ba)       ≤ 10.0 ppb       < 1.0 ppb   |                                  | • •           | • •        |
| Trace Impurities – Beryllium (Be)  Trace Impurities – Bismuth (Bi)  Trace Impurities – Boron (B)  Trace Impurities – Cadmium (Cd)  Trace Impurities – Cadmium (Cd)  Trace Impurities – Calcium (Ca)  Trace Impurities – Chromium (Cr)  Trace Impurities – Chromium (Cr)  Trace Impurities – Cobalt (Co)  Trace Impurities – Cobalt (Co)  Trace Impurities – Copper (Cu)  Trace Impurities – Copper (Cu)  Trace Impurities – Gallium (Ga)  Trace Impurities – Gallium (Ga)  Trace Impurities – Gold (Au)  Trace Impurities – Gold (Au)  Express of the substitute of the                                   |                                  |               | • •        |
| Trace Impurities – Bismuth (Bi)   |                                  | • •           | < 1.0 ppb  |
| Trace Impurities – Boron (B)  |                                  |               | < 1.0 ppb  |
| Trace Impurities - Cadmium (Cd)  Frace Impurities - Calcium (Ca)  Frace Impurities - Chromium (Cr)  Frace Impurities - Chromium (Cr)  Frace Impurities - Cobalt (Co)  Frace Impurities - Copper (Cu)  Frace Impurities - Callium (Ga)  Frace Impurities - Gallium (Ga)  Frace Impurities - Germanium (Ge)  Frace Impurities - Gold (Au)  Frace Impurities - Gold (Au)  Frace Impurities - Fron (Fe)  Frace Impurities - Lead (Pb)  Frace Impurities - Lithium (Li)  Frace Impurities - Magnesium (Mg)  Frace Impurities - Manganese (Mn)  Frace Impurities - Nickel (Ni)  |                                  |               | • •        |
| Trace Impurities – Calcium (Ca)   |                                  | • •           | < 5.0 ppb  |
| Trace Impurities - Chromium (Cr)  Trace Impurities - Cobalt (Co)  Trace Impurities - Copper (Cu)  Trace Impurities - Copper (Cu)  Trace Impurities - Gallium (Ga)  Trace Impurities - Garmanium (Ge)  Trace Impurities - Gold (Au)  Heavy Metals (as Pb)  Trace Impurities - Iron (Fe)  Trace Impurities - Lead (Pb)  Trace Impurities - Lead (Pb)  Trace Impurities - Lithium (Li)  Trace Impurities - Magnesium (Mg)  Trace Impurities - Magnesium (Mg)  Trace Impurities - Manganese (Mn)  Trace Impurities - Magnesium (Mg)  Trace Impurities - Manganese (Mn)  Trace Impurities - Nickel (Ni)  |                                  | • ,           | < 1 ppb    |
| Trace Impurities – Cobalt (Co)  |                                  |               | 2.3 ppb    |
| Trace Impurities - Copper (Cu)  Trace Impurities - Gallium (Ga)  Trace Impurities - Germanium (Ge)  Trace Impurities - Gold (Au)  Example 10.0 ppb  |                                  |               | < 1.0 ppb  |
| Trace Impurities – Gallium (Ga)  Trace Impurities – Germanium (Ge)  Trace Impurities – Gold (Au)  Heavy Metals (as Pb)  Trace Impurities – Iron (Fe)  Trace Impurities – Lead (Pb)  Trace Impurities – Lead (Pb)  Trace Impurities – Lithium (Li)  Trace Impurities – Magnesium (Mg)  Trace Impurities – Magnese (Mn)  Trace Impurities – Nickel (Ni)   |                                  | • •           | < 1.0 ppb  |
| Trace Impurities – Germanium (Ge)  Trace Impurities – Gold (Au)  Heavy Metals (as Pb)  Trace Impurities – Iron (Fe)  Trace Impurities – Lead (Pb)  Trace Impurities – Lead (Pb)  Trace Impurities – Lithium (Li)  Trace Impurities – Magnesium (Mg)  Trace Impurities – Magnesium (Mg)  Trace Impurities – Manganese (Mn)  Trace Impurities – Nickel (Ni)  Trace Impurities – Nickel (Ni)   |                                  | • •           | < 1.0 ppb  |
| Trace Impurities – Gold (Au)  4 20 ppb  5 ppb  6 5 ppb  7 Trace Impurities – Iron (Fe)  6 40.0 ppb  6 20.0 ppb  7 Trace Impurities – Lithium (Li)  6 10.0 ppb  7 Trace Impurities – Magnesium (Mg)  7 Trace Impurities – Manganese (Mn)  7 Trace Impurities – Manganese (Mn)  7 Trace Impurities – Mickel (Ni)  | · •                              |               | < 1.0 ppb  |
| Heavy Metals (as Pb)    Second Policy   Second Policy   |                                  | • • •         | < 10 ppb   |
| Trace Impurities – Iron (Fe)  \$\leq\$ 40.0 ppb \$\leq\$ 40.0 ppb \$\leq\$ 20.0 ppb \$\leq\$ 20.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 20 ppb \$\leq\$ 20 ppb \$\leq\$ 20 ppb \$\leq\$ 20 ppb \$\leq\$ 21.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 20 ppb \$\leq\$ 21.0 ppb   |                                  |               | < 5 ppb    |
| Trace Impurities – Lead (Pb)  ≤ 20.0 ppb  ≤ 20.0 ppb  < 10.0 ppb  < 10.0 ppb  < 1.0 ppb   |                                  | • •           | 100 ppb    |
| Frace Impurities – Lithium (Li)  Frace Impurities – Magnesium (Mg)  Frace Impurities – Manganese (Mn)  Frace Impurities – Manganese (Mn)  Frace Impurities – Nickel (Ni)  Frace Impurities – Nickel (Ni)  |                                  | • •           | < 1.0 ppb  |
| Frace Impurities – Magnesium (Mg)  Frace Impurities – Manganese (Mn)  ≤ 20 ppb  ≤ 1.0 ppb  < 1 ppb  < 1.0 ppb  < 1.0 ppb  |                                  | • •           | < 10.0 ppb |
| Frace Impurities – Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb  |                                  |               | < 1.0 ppb  |
| race Impurities – Nickel (Ni)   |                                  |               | < 1 ppb    |
| ≤ 20.0 ppb < 5.0 ppb  |                                  | • •           | < 1.0 ppb  |
|   | THERET (INI)                     | ≤ 20.0 ppb    | < 5.0 ppb  |

>>> Continued on page 2 >>>





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

| Test                                | Specification | D 1        |
|-------------------------------------|---------------|------------|
| Trace Impurities – Niobium (Nb)     |               | Result     |
| Trace Impurities – Potassium (K)    | ≤ 50.0 ppb    | < 1.0 ppb  |
| Trace Impurities – Silicon (Si)     | ≤ 50 ppb      | 16 ppb     |
|                                     | ≤ 50 ppb      | < 10 ppb   |
| Trace Impurities – Silver (Ag)      | ≤ 20.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Sodium (Na)      | ≤ 150.0 ppb   |            |
| Trace Impurities - Strontium (Sr)   | ≤ 30.0 ppb    | < 5.0 ppb  |
| Trace Impurities – Tantalum (Ta)    |               | < 1.0 ppb  |
| Trace Impurities – Thallium (TI)    | ≤ 10.0 ppb    | < 5.0 ppb  |
| Trace Impurities – Tin (Sn)         | ≤ 10.0 ppb    | < 5.0 ppb  |
|                                     | ≤ 20.0 ppb    | < 10.0 ppb |
| Trace Impurities – Titanium (Ti)    | ≤ 10.0 ppb    | < 1.0 ppb  |
| Frace Impurities – Vanadium (V)     | ≤ 10.0 ppb    |            |
| Frace Impurities – Zinc (Zn)        | ≤ 20.0 ppb    | < 1.0 ppb  |
| race Impurities – Zirconium (Zr)    |               | < 1.0 ppb  |
| Particle Count – 0.5 µm and greater | ≤ 10.0 ppb    | < 1.0 ppb  |
| Particle Count – 1.0 µm and greater | ≤ 60 par/mi   | 10 par/ml  |
| and greater                         | ≤ 10 par/ml   | 3 par/ml   |

Nitric Acid 69% **CMOS** 





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

Test Specification Result

For Microelectronic Use

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

Jamie Croak Director Quality Operations, Bioscience Production

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



# Certified Reference Material CRM

M6030

ANAB ISO 17034 Accredited

CERTIFIED WEIGHT REPORT: Part Number: Lot Number: 57047 122823 R = 8 | 5 | 24 Solvent: 24002546 Lot # Nitric Acid

Nominal Concentration (µg/mL): NIST Test Number: Recommended Storage: **Expiration Date:** 1000 **6UTB** Ambient (20 °C) 122826 5E-05 Balance Uncertainty 2%

> <u>E</u> 80.0

> > Nitric Acid

Formulated By:

Benson Chan

122823

Description:

Silver (Ag)

Weight shown below was diluted to (mL): 4000.30 0.058 Flask Uncertainty

1. Silver nitrate (Ag) Compound IN035 J0612AGA1 RM# Number 헏 Conc. (µg/mL) 1000.0 Nominal Purity Uncertainty Assay 8 Purity (%) 0.10 63.7 38 Weight (g) 6.27992 Target Weight (g) Conc. (µg/mL) 6.27998 Actual 1000.0 Actual +/- (µg/mL) Uncertainty Expanded 2.0 7761-88-B CAS# (Solvent Safety Info. On Attached pg.) SDS Information 10 ug/m3 Z 3151

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

NIST SRM

Reviewed By: Pedro L. Rentas 122823

www.absolutestandards.com



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

Physical Characterization:

(T)= Target analyte

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

Certified by:

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

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

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Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

Read instructions carefully before opening bottle(s) and proceeding with the

analyses,

N6152

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

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

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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

Page 1 of 2

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

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

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



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



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

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

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

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO $_3$ . Analyze this ICSA solution by ICP-AES.

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

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

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

| "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211, AND ICSA-1211 MIXED WITH ICSB-0710 | Table 1. |
|--|----------|
|  |          |

| HgiH<br>timid<br>(J\bu) | wod<br>Limit<br>(J\gy) | A haq<br>4 haq+<br>(J\by) | High<br>Himid<br>(A\g4) | Low<br>Limit<br>(µg/L) | A hsq (J\gy) | свог | Flement |
|-------------------------|------------------------|---------------------------|-------------------------|------------------------|--------------|------|---------|
| 285000                  | 509000                 | 247000                    | 294000                  | 216000                 | S22000       | 200  | IA      |
| 117                     | 979                    | 818                       | 0.09                    | 0.09-                  | (0.0)        | 09   | 9S      |
| 120                     | 4.88                   | 104                       | 0.01                    | 0.01-                  | (0.0)        | 01   | sA      |
| 757                     | 337                    | (537)                     | 506                     | <b>⊅6</b> ŀ-           | (0.9)        | 200  | Ba      |
| 078                     | 420                    | 967                       | 0.3                     | 0.8-                   | (0.0)        | 0.8  | Be      |
| 1120                    | 928                    | 279                       | 0.8                     | 0.4-                   | (0.1)        | 0.8  | Cd      |
| 271000                  | 188000                 | 532000                    | 282000                  | 208000                 | 242000       | 2000 | БЭ      |
| 429                     | 097                    | 242                       | 0.28                    | 42.0                   | (0.23)       | 01   | Cr      |
| 848                     | t0t                    | 974                       | 0.03                    | 0.03-                  | (0.0)        | 09   | 0)      |
| 883                     | 434                    | 119                       | 0.72                    | 0.62-                  | (0.2)        | 52   | nე      |
| 114500                  | 84400                  | 99300                     | 116500                  | 00998                  | 101000       | 100  | Еe      |
| 0.63                    | 39.0                   | (0.64)                    | 0.01                    | 0.01-                  | (0.0)        | 01   | dЯ      |
| 286000                  | 210000                 | 248000                    | 294000                  | 216000                 | S22000       | 2000 | ВМ      |
| <b>78</b> 9             | 430                    | 703                       | 22.0                    | 0.8-                   | (0.7)        | 91   | uΜ      |
| 1100                    | 018                    | <del>1</del> 26           | 42.0                    | 0.86-                  | (0.2)        | 07   | !N      |
| 0.18                    | 0.11                   | (0.94)                    | 35.0                    | 0.36-                  | (0.0)        | 35   | əs      |
| 232                     | 021                    | 201                       | 0.01                    | 0.01-                  | (0.0)        | 01   | ₽A      |
| 133                     | 0.88                   | (801)                     | 0.82                    | 0.82-                  | (0.0)        | 52   | ΙL      |
| 999                     | 714                    | 167                       | 0.03                    | 0.08-                  | (0.0)        | 90   | Λ       |
| 9601                    | 608                    | 796                       | 0.09                    | 0.09-                  | (0.0)        | 09   | uZ      |

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



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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request M6153

### (A) SAMPLE DESCRIPTION

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

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

### (B) BREAKAGE OR MISSING ITEMS

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

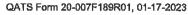
QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120

### (C) ANALYSIS OF SAMPLES

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

Page 1 of 2











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

### **APTIM**

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

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

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

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

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

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

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

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211, AND ICSA-1211 MIXED WITH ICSB-0710

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

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

## Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



# Certified Reference Material CRM

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



|                          |              |             |               | 071724                     |                  |                      |                                | 071724              |   |                 |
|--------------------------|--------------|-------------|---------------|----------------------------|------------------|----------------------|--------------------------------|---------------------|---|-----------------|
|                          |              | 1. NAMEDER  | }             | Giovanni Esposito          | 0                | d                    | Kento                          | Pedro L. Rentas     |   | SDS Information |
|                          |              | Things A.   | 3             | Nitric Acid Formulated By: | 1                | 1                    | Medle                          | Reviewed By:        |   | Expanded        |
|                          |              |             |               | Nitric Acid                |                  |                      |                                |                     |   |                 |
| Solvent:                 | Nitric Acid  |             |               | 40.0                       | (mL)             |                      |                                |                     |   |                 |
| Lot #                    | 24002546     |             |               | 2.0%                       |                  |                      |                                | Balance Uncertainty | Flask Uncertainty                       |                 |
| 00                       | )            |             |               |                            |                  |                      |                                | 5E-05               | 0.058                                   |                 |
| X6/60                    |              |             | (QS)          |                            |                  | 0 °C)                |                                |                     | 2000.26                                 |                 |
|                          | 57051        | 071724      | Antimony (Sb) |                            | 071727           | Ambient (20 °C)      | 1000                           | eutb                | diluted to (mL):                        |                 |
| 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): |                 |

NIST SRM

LD50

OSHA PEL (TWA)

CAS#

+/- (µg/mL) Uncertainty Expanded

Conc. (µg/mL) Conc. (µg/mL)

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Initial

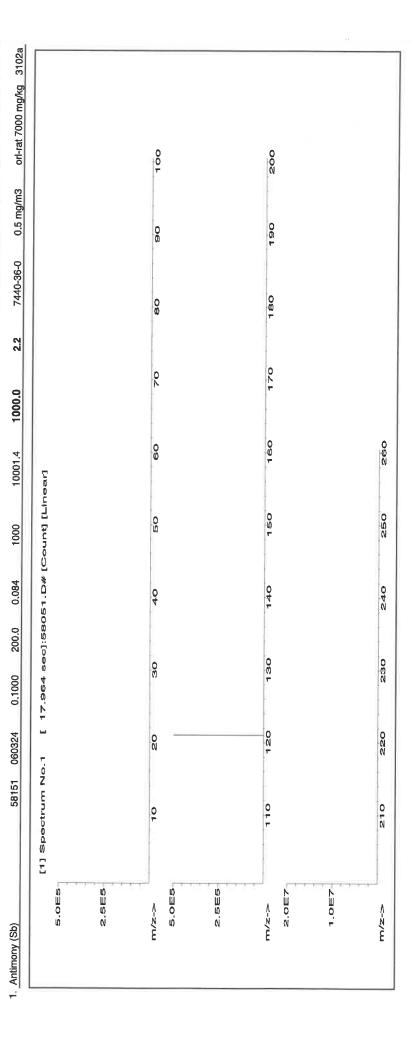
Dilution Factor

Ľ

Number Part

Compound

(Solvent Safety Info. On Attached pg.)



## Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

|   |       |    |       |    |       |    | Trace M | etals | Verifica | tion | by ICP-M | 15 (4 | ug/mL) |    |       |    |       |    |       |
|---|-------|----|-------|----|-------|----|---------|-------|----------|------|----------|-------|--------|----|-------|----|-------|----|-------|
| Ш |       |    |       |    |       |    |         |       |          |      |          |       | ш      |    |       |    |       | ı  |       |
|   | <0.02 | 25 | <0.02 | Dy | <0.02 | Ħ  | <0.02   | Li    | <0.02    | ž    | <0.02    | 播     | <0.02  | Se | <0.2  | TP | <0.02 | ≱  | <0.02 |
|   | H     | ű  | <0.2  | 型  | <0.02 | Но | <0.02   | ľ     | <0.02    | £    | <0.02    | Re    | <0.02  | Si | <0.02 | Te | <0.02 | n  | <0.02 |
|   | <0.2  | రి | <0.02 | E  | <0.02 | пĮ | <0.02   | Mg    | <0.01    | ő    | <0.02    | Rh    | <0.02  | Ag | <0.02 | F  | <0.02 | >  | <0.02 |
|   | <0.02 | ర  | <0.02 | B  | <0.02 | П  | <0.02   | Mn    | <0.02    | Pd   | <0.02    | Rb    | <0.02  | Na | <0.2  | Ή  | <0.02 | Yb | <0.02 |
|   | <0.01 | ర్ | <0.02 | Ga | <0.02 | 윤  | <0.2    | Hg    | <0.2     | Ь    | <0.02    | Ru    | <0.02  | Sr | <0.02 | Tu | <0.02 | Y  | <0.02 |
|   | <0.02 | රි | <0.02 | පී | <0.02 | La | <0.02   | Mo    | <0.02    | 盂    | <0.02    | Sm    | <0.02  | S  | <0.02 | Sn | <0.02 | Zu | <0.02 |
|   | <0.02 | చ  | <0.02 | Αu | <0.02 | Pb | <0.02   | PN    | <0.02    | М    | <0.2     | Sc    | <0.02  | Ta | <0.02 | Ë  | <0.02 | Zr | <0.02 |

(T) = Target analyte

Certified by:

### Physical Characterization:

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



the preparation of all standards.

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

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

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



### Certificate of Analysis

ustry. R: 8/5/24

M6019

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:** 

Single Analyte Custom Grade Solution

Catalog Number:

CGSR1

Lot Number:

U2-SR730227

Matrix:

0.1% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea:

Strontium

Starting Material:

SrCO3

Starting Material Lot#:

M2-2192

Starting Material Purity:

99.9993%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

1001 ± 3 µg/mL

Density:

1.000 g/mL (measured at 20 ± 4 °C)

### Assay Information:

Assay Method #1

998 ± 4 µg/mL

ICP Assay NIST SRM Traceable to 3153a Lot Number: K2-SR650985

Assay Method #2

1001 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

1001 ± 2 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty (stora

### 4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

- 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  $0.3 \ \mu m$ .

| М | Ag | < | 0.001980 | М | Eu | < | 0.000495 | 0 | Na |   | 0.000200 | М | Se | < | 0.013862 | 0 | Zn |   | 0.000143 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| 0 | Al |   | 0.000370 | 0 | Fe |   | 0.000410 | M | Nb | < | 0.000495 | i | Si | < |          | М | Zr | < | 0.000495 |
| M | As | < | 0.000495 | М | Ga | < | 0.000495 | М | Nd | < | 0.000495 | M | Sm | < | 0.000495 |   |    |   |          |
| M | Au | < | 0.000989 | М | Gd | < | 0.000495 | 0 | Ni | < | 0.007631 | M | Sn | < | 0.000990 |   |    |   |          |
| M | В  | < | 0.039606 | М | Ge | < | 0.000495 | М | Os | < | 0.000494 | s | Sr | < |          |   |    |   |          |
| М | Ba |   | 0.006486 | M | Hf | < | 0.000495 | i | Р  | < |          | М | Ta | < | 0.000495 |   |    |   |          |
| М | Be | < | 0.000990 | M | Hg | < | 0.000989 | M | Pb | < | 0.002970 | М | Tb | < | 0.000495 |   |    |   |          |
| М | Bi | < | 0.000495 | M | Но | < | 0.000495 | М | Pd | < | 0.003957 | М | Te | < | 0.027724 |   |    |   |          |
| 0 | Ca |   | 0.004255 | M | ln | < | 0.000495 | M | Pr | < | 0.000495 | М | Th | < | 0.000990 |   |    |   |          |
| M | Cd |   | 0.001339 | M | lr | < | 0.000494 | M | Pt | < | 0.002970 | М | Tī | < | 0.005940 |   |    |   |          |
| М | Çe | < | 0.004950 | 0 | K  | < | 0.008184 | М | Rb | < | 0.002970 | М | TI | < | 0.000495 |   |    |   |          |
| M | Co | < | 0.000495 | M | La | < | 0.000495 | М | Re | < | 0.000495 | М | Tm | < | 0.000495 |   |    |   |          |
| 0 | Cr | < | 0.003207 | 0 | Li | < | 0.000884 | 0 | Rh | < | 0.012829 | М | U  | < | 0.001485 |   |    |   |          |
| М | Cs | < | 0.000990 | M | Lu | < | 0.002970 | М | Ru | < | 0.000989 | М | ٧  | < | 0.001980 |   |    |   |          |
| M | Cu |   | 0.000099 | 0 | Mg |   | 0.000064 | i | S  | < |          | М | W  | < | 0.003960 |   |    |   |          |
| М | Dy | < | 0.000495 | 0 | Mn |   | 0.000066 | М | Sb | < | 0.014852 | 0 | Υ  | < | 0.000995 |   |    |   |          |
| М | Er | < | 0.000495 | М | Мо | < | 0.001980 | М | Sc | < | 0.001980 | М | Yb | < | 0.000495 |   |    |   |          |

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

### 6.0 INTENDED USE

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

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

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

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

### 7.1 Storage and Handling Recommendations

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 87.62 +2 6 Sr(H2O)6+2 Chemical Compatibility - Soluble in HCl, and HNO3. Avoid H2SO4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

**Stability -** 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO3 / LDPE container.

**Sr Containing Samples (Preparation and Solution) -**Metal (Best dissolved in diluted HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute HCl).

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

| Technique/Line     | Estimated D.L.         | Order | Interferences (underlined indicates severe) |
|--------------------|------------------------|-------|---|
| ICP-MS 88 amu      | 1200 ppt               | N/A   | 72Ge16O, 176Yb+2,                           |
|                    |                        |       | 176Lu+2 , 176Hf+2                           |
| ICP-OES 407.771 nm | 0.0004 / 0.00006 µg/mL | 1     | U, Ce                                       |
| ICP-OES 421.552 nm | 0.0008 / 0.00004 μg/mL | 1     | Rb  |
| ICP-OES 460.733 nm | 0.07 / 0.003 μg/mL     | 1     | Се  |
|                    |                        |       |   |

### 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, Ve. 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 03, 2023

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

### 11.2 Lot Expiration Date

- March 03, 2028
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director 20178hi

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

www.absolutestandards.com



## Certified Reference Material CRM

M6023

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

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

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

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

CAS#

OSHA PEL (TWA)

LD50

SRM

| -z/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>4.<br>4.                          |  |
| 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       |       |   | 1000   |
|      |       |       |          |      |          |       |   |  |
|      |       |       | 190      |      | 90       |       |   | or any   |
|      |       |       | 200      |      | 100      |       |   |  |
|      |       |       | ŏ        |      | ŏ        |       |   | See all see al |
|      |       |       |          |      |          |       |   | 0  |

Part # 57081



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

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

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

## Physical Characterization:

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

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

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

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

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

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

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

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

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

www.absolutestandards.com



# Certified Reference Material CRM

M6021

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

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

Nitric Acid

Ambient (20 °C) 2.0% (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 ρţ 0.1000 Dilution Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) 200.0 Initial Uncertainty 0.084 Nominal 1000 Conc. (µg/mL) Conc. (µg/mL) 10000.3 nitial 1000.0 Final +/- (µg/mL) Uncertainty Expanded 22 7803-55-6 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) 0.05 mg/m3 **SDS Information** orl-rat 58.1mg/kg LD50 3165 NIST SRM

| <b>7</b> | 2.588 | m/z->-<br>5.0E8 | 1.0E7 | m/z->    | 1.006 | 2.0E6 |
|----------|-------|-----------------|-------|----------|-------|-------|
|          |       |                 |       |          |       |       |
| 210      |       | 110             |       | ō        |       |       |
| 220      |       | ,<br>N          |       | N.       |       |       |
| 0        |       | 0               |       |          |       |       |
| 200      |       | 130             |       | 90       |       |       |
| 240      |       | 140             |       | 4.0      |       |       |
| 0        |       |                 |       |          |       |       |
| NG0      |       | 150             |       | <b>5</b> |       |       |
| 260      |       | 160             |       | 60       |       |       |
| U        |       |                 |       |          |       |       |
|          |       | 170             |       | 70       |       |       |
|          |       | 180             |       | 80       |       |       |
|          |       | G               |       |          |       |       |
|          |       | 190             |       | 90       |       |       |
|          |       | 200             |       | 100      |       |       |
|          |       | Ü               |       | J        |       |       |

Part # 57023



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

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

|                      | r     |               | _     | -             | _              | -             | -     | -        | -  |                    | T                   | ۰       |
|----------------------|-------|---------------|-------|---------------|----------------|---------------|-------|----------|--|--------------------|---------------------|---------|
|                      |       | <b>3</b>      | B!    | Ве            | 152            | 2             | 5     | <i>?</i> | ≥  |                    | ı                   |         |
|                      |       | A 8           | 40.00 | <u> 0</u> ,01 | 20.02          | 2 6           | 4 6 5 | 3        | <0.02  |                    |                     |         |
|                      |       | <b>3</b> 8    | 3     | 유             | S.             | <u>ج</u>      | 2 5   | ?        | 8  |                    |                     |         |
|                      | 2000  | 3 8           | 3     | 40.02         | 40.02          | 20.02         | 3 6   | 3        | A),02  | THE REAL PROPERTY. |                     |         |
|                      |       | <u> </u>      |       | <u>ئ</u>      | 2              | Ę             | 1 12  | 7        | ΔÅ   |                    |                     | Tropa M |
|                      | 20.02 | 3 6           | 9 9   | S             | ∆0.02          | 20.02         | 20.02 | 3        | 40.02  | AND DESIGNATION    |                     |         |
|                      | 70    | 3 2           | 7 6   | ş)            | ==             | 료             | ЮН    | : ;      | HF   |                    |                     |         |
| (T) = Target analyte | 20.02 | 868           | 3 6   | 7             | ∆<br>.02       | 40.02         | 40.02 | 0.00     | co oz  |                    | Irace M             |         |
|                      | Z     | MIO           | 1 0   | 5             | M <sub>D</sub> | Mg            | Ē     | . [      |  |                    | letals Verification |         |
|                      | 8,02  | 20.02         | 200   | 3             | <b>∆</b> 002   | 10.0          | 40.02 | 10.02    | 2000   |                    |                     |         |
|                      | Ě     | 1 3           | , ,   | ,             | 2              | õ             | Z     | 2        |  |                    |                     |         |
|                      | 40,2  | 40.02         | 20.02 | 3             | &<br>83<br>83  | 40.02         | 40,02 | 20.02    | 3  |                    | by ICP-N            |         |
|                      | Sc    | Sm            | 20    | ,             |                | 2             | Re    | 7        |  | ŀ                  | E S                 |         |
|                      | 40.02 | 40.02         | 40.02 |               | 4              | ∆.02          | <0.02 | 20.02    |  | ľ                  | g/mL)               |         |
|                      | Ta    | s             | Sr    |               | Z,             | Ag            | δi    | 8        |  |                    |                     | ı       |
|                      | <0.02 | <b>40.02</b>  | 40.02 |               | 3              | <b>∆</b> 0.02 | 6.02  | <0.2     |  |                    |                     |         |
|                      | н     | Sh            | Tm    | Ě             | ,              | =             | Te    | 16       |  |                    |                     |         |
|                      | <0.02 | 40.02         | <0.02 | 10.02         | 3              | 40.02         | 40.02 | 40.02    | The second second second   |                    |                     |         |
| İ                    | Zr    | Zn            | ×     | 10            | \$             | V             | Ϥ     | ₹        | NAME AND ADDRESS OF  |                    |                     |         |
|                      | <0.02 | <b>∆</b> 0.02 | 40,02 | 20.02         | 3              | -)            | A).02 | 0.02     | The Part of the Pa |                    |                     |         |

## 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).