

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

|   | Q2250<br>Dissolved | Order ID :<br>Test : |
|---|--------------------|----------------------|
| Prepbatch ID :         PB168360,PB168379,           Sequence ID/Qc Batch ID:         LB136079,LB136121,LB136121,LB136121, | ,                  | •                    |

### Standard ID :

MP85156,MP85829,MP85830,MP85831,MP85832,MP85833,MP85834,MP85835,MP85836,MP85837,MP85838,MP858839,MP85840,MP85841,MP85842,MP85843,MP85844,MP85845,MP85846,MP85847,MP85848,MP85849,MP85892,MP85893,MP85894,MP85895,MP85915,MP85916,MP85917,MP85918,MP85919,MP85920,MP85921,MP85922,MP85923,MP85924,MP85925,MP85926,MP85927,MP85932,

### Chemical ID :

M4371,M4465,M4916,M4920,M5062,M5305,M5471,M5520,M5658,M5739,M5751,M5798,M5799,M5800,M5801,M 5811, M5815,M5817,M5873,M5874,M5884,M5942,M5961,M5962,M5977,M5981,M6021,M6023,M6025,M6026,M6028,M6030,M6032,M6041,M6055,M6079,M6086,M6127,M6128,M6137,M6142,M6144,M6145,M6150,M6151,M6153,M6158,M615 9,M6160,M6161,M6162,W3112,



| Recipe<br>ID<br>170<br>FROM  | NAME<br>1:1HCL<br>1250.00000ml of M6151 + 1250.0000  | <u>NO.</u><br><u>MP85156</u><br>00ml of W31 | Prep Date<br>04/07/2025<br>12 = Final Q  | Expiration<br>Date<br>08/18/2025<br>uantity: 2500.00 | Prepared<br><u>By</u><br>Kareem<br>Khairalla | <u>ScaleID</u><br>None                                       | <u>PipetteID</u><br>None                     | Sarabjit Jaswal<br>04/07/2025 |
|------------------------------|--|---|--|--|--|--|--|-------------------------------|
| Recipe<br>ID<br>1122<br>FROM | NAME           ICPMS CALIB           BLANK(S0/ICB/CCB)           25.00000ml of M6151 + 4925.00000r | <u>NO.</u><br><u>MP85829</u><br>nl of W3112 | Prep Date<br>05/30/2025<br>2 + 50.00000m | Expiration<br>Date<br>06/20/2025                     |  | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)<br>5000.000 ml | PipettelD<br>METALS_PIP<br>ETTE_1 (ICP<br>A) | Sarabjit Jaswal<br>06/14/2025 |



| Recipe<br>ID<br>2902<br>FROM | NAME<br>S8 ICPMS<br>1.00000ml of M6159 + 2.50000ml of<br>of M6144 + 79.00000ml of MP85829 |                              |                         |                                  |                               | ScaleID<br>METALS_SCA<br>LE_3 (M SC-3)<br>5.00000ml of M | ETTE_1 (ICP<br>A) |                               |
|------------------------------|---|------------------------------|-------------------------|----------------------------------|-------------------------------|--|-------------------|-------------------------------|
| Recipe<br>ID<br>3947         | <u>NAME</u><br>S7(SFAM,6020,200.8)  | <u>NO.</u><br><u>MP85831</u> | Prep Date<br>05/30/2025 | Expiration<br>Date<br>06/20/2025 | Prepared<br>By<br>Janvi Patel | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)            |                   | Sarabjit Jaswal<br>06/14/2025 |

 FROM
 0.10000ml of M6153 + 0.40000ml of M6026 + 1.00000ml of M5799 + 1.00000ml of M5981 + 1.00000ml of M6079 + 1.00000ml of M6137 + 1.90000ml of M6159 + 10.00000ml of M5942 + 10.00000ml of M5977 + 10.00000ml of M6162 + 2.00000ml of M5815 + 2.00000ml of M5817 + 4.00000ml of M6032 + 4.90000ml of M5520 + 4.90000ml of M5811 + 5.00000ml of M6151 + 50.00000ml of M5305 + 834.10000ml of W3112 + 9.00000ml of M5751 + 9.00000ml of M6128 + 9.00000ml of M6145 + 9.90000ml of M6086 + 9.90000ml of M6127 + 9.90000ml of M6144 = Final Quantity: 1000.000 ml



| Recipe<br>ID<br>3948<br>FROM       | NAME<br>S6(SFAM,6020,200.8)<br>0.50000ml of M6151 + 1.00000ml of | <u>NO.</u><br><u>MP85832</u><br>M6162 + 48 | Prep Date<br>05/30/2025        | Expiration<br>Date<br>06/20/2025<br>V3112 + 50.000 |   | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)<br>331 = Final Qua | ETTE_1 (ICP<br>A) | Sarabjit Jaswal<br>06/14/2025<br>ml |
|------------------------------------|--|--|--------------------------------|--|---|--|-------------------|-------------------------------------|
| <u>Recipe</u><br><u>ID</u><br>3949 | <u>NAME</u><br>S5(SFAM,6020,200.8)                               | <u>NO.</u><br>MP85833                      | <b>Prep Date</b><br>05/30/2025 | Expiration<br>Date<br>06/20/2025                   | <u>Prepared</u><br><u>By</u><br>Janvi Patel | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)                    |                   | Sarabjit Jaswal                     |



| <u>ID</u><br>3954<br><u>FROM</u> | NAME<br>S4(SFAM,6020,200.8)<br>0.50000ml of M6151 + 1.00000ml of  | <u>NO.</u><br><u>MP85834</u><br>M6162 + 86 | Prep Date<br>05/30/2025 | Expiration<br>Date<br>06/20/2025<br>V3112 + 12.500 | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)<br>331 = Final Qua | ETTE_1 (ICP<br>A) | Supervised By<br>Sarabjit Jaswal<br>06/14/2025<br>ml |
|----------------------------------|---|--|-------------------------|--|--|-------------------|--|
| Recipe<br>ID<br>3951<br>FROM     | NAME<br>S3(SFAM, 6020,200.8)<br>0.50000ml of M6151 + 1.00000ml of | <u>NO.</u><br><u>MP85835</u>               | Prep Date<br>05/30/2025 | Expiration<br>Date<br>06/20/2025                   | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)                    | ETTE_1 (ICP<br>A) | Sarabjit Jaswal<br>06/14/2025                        |



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| Recipe<br>ID<br>3955 | NAME<br>S2CONC(SFAM,6020,200.8)  | <u>NO.</u><br>MP85836  | Prep Date<br>05/30/2025  | Expiration<br>Date<br>08/18/2025                                     | <u>Prepared</u><br><u>By</u><br>Janvi Patel                          | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)                        | ETTE_1 (ICP  |                            |
|----------------------|--|--|--|--|--|--|--|----------------------------|
| FROM                 | 0.00500ml of M6153 + 0.05000ml of<br>of M5981 + 0.05000ml of M6023 + 0.<br>0.05000ml of M6128 + 0.10000ml of<br>of M5799 + 0.25000ml of M5811 + 0.<br>0.25000ml of M6145 + 0.50000ml of<br>of M6151 + 2.50000ml of M5520 + 2.<br>230.04500ml of W3112 = Final Quar | 05000ml of<br>M5658 + 0.<br>25000ml of<br>M6032 + 0.<br>50000ml of | M6025 + 0.05<br>10000ml of M<br>M5942 + 0.25<br>50000ml of M<br>M6086 + 2.50 | 5000ml of M602<br>5751 + 0.10000<br>5000ml of M596<br>6137 + 1.25000 | 28 + 0.05000ml<br>0ml of M6159 +<br>62 + 0.25000ml<br>0ml of M5815 + | of M6030 + 0.0<br>0.10000ml of M<br>of M5977 + 0.2<br>1.25000ml of M | 5000ml of M60<br>6160 + 0.2500<br>5000ml of M60<br>5817 + 1.2500 | 79 +<br>0ml<br>21 +<br>0ml |

| Recipe    | NAME                              | NO             | Bron Doto     | Expiration     | Prepared     | SaalalD         | DinettelD              | Supervised By   |
|-----------|-----------------------------------|----------------|---------------|----------------|--------------|-----------------|------------------------|-----------------|
| <u>ID</u> | NAME                              | <u>NO.</u>     | Prep Date     | <u>Date</u>    | <u>By</u>    | <u>ScaleID</u>  | PipettelD              | Sarabjit Jaswal |
| 3956      | S2(SFAM,6020,200.8)               | <u>MP85837</u> | 05/30/2025    | 06/20/2025     |              | METALS_SCA      |                        |                 |
|           |                                   |                |               |                |              | LE_3 (M SC-3)   |                        | 06/14/2025      |
| FROM      | 0.50000ml of M6151 + 1.00000ml of | M6162 + 98     | .00000ml of V | V3112 + 0.5000 | 0ml of MP858 | 36 = Final Quar | A)<br>htity: 100.000 r | nl              |
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A)

### Metals STANDARD PREPARATION LOG

| Recipe<br>ID<br>3957<br>FROM       | NAME<br>S1(SFAM,6020,200.8)<br>0.50000ml of M6151 + 1.00000ml of | <u>NO.</u><br><u>MP85838</u><br>M6162 + 88 | Prep Date<br>05/30/2025<br>3.50000ml of V | Expiration<br>Date<br>06/20/2025<br>W3112 + 10.000 | ScaleID<br>METALS_SCA<br>LE_3 (M SC-3)<br>337 = Final Qua | ETTE_1 (ICP<br>A) |                 |
|------------------------------------|--|--|---|--|---|-------------------|-----------------|
| <u>Recipe</u><br><u>ID</u><br>3958 | NAME<br>ICV(SFAM)  | <u>NO.</u><br>MP85839                      | Prep Date<br>05/30/2025                   | Expiration<br>Date<br>06/20/2025                   | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)             |                   | Sarabjit Jaswal |

**FROM** 2.00000ml of M6150 + 98.00000ml of MP85829 = Final Quantity: 100.000 ml



| or<br>N | l<br>0.20000ml of M6026 + 0.50000ml of l<br>of M6137 + 1.00000ml of M5815 + 1.<br>//5811 + 2.00000ml of M6032 + 24.9 |            |                               | 5799 + 0.5000                   |   | LE_3 (M SC-3)   | A)  | 06/14/2025 |
|---------|--|------------|-------------------------------|---------------------------------|---|---|---|------------|
| 5       | + 4.50000ml of M5751 + 4.50000ml of<br>5.50000ml of M5942 + 5.50000ml of l   | of M6128 + | 16086 + 24.95<br>4.50000ml of | 5000ml of M612<br>M6145 + 4.950 | 162 + 12.45000<br>27 + 24.95000m<br>00ml of M6159 | ml of M5520 + 1<br>nl of M6144 + 25<br>+ 5.00000ml of | 6079 + 0.5000<br>2.45000ml of<br>6.00000ml of M |            |

| Recipe    |                                  |                |               | Expiration     | Prepared  |                |                   | Supervised By   |
|-----------|----------------------------------|----------------|---------------|----------------|-----------|----------------|-------------------|-----------------|
| <u>ID</u> | NAME                             | <u>NO.</u>     | Prep Date     | <u>Date</u>    | <u>By</u> | <u>ScaleID</u> | PipetteID         | Sarabjit Jaswal |
| 1142      | ICSA ICPMS                       | <u>MP85841</u> | 05/30/2025    | 06/20/2025     |           | METALS_SCA     |                   |                 |
|           |                                  |                |               |                |           | LE_3 (M SC-3)  | ETTE_1 (ICP<br>A) | 06/14/2025      |
| FROM      | 10.00000ml of M5873 + 90.00000ml | of MP85829     | ) = Final Qua | ntity: 100.000 | ml        |                | <b>A</b> )        |                 |
|           |                                  |                |               |                |           |                |                   |                 |
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| <u>Recipe</u><br><u>ID</u><br>1143 | NAME<br>ICSAB ICPMS              | <u>NO.</u><br>MP85842 | Prep Date<br>05/30/2025 | Expiration<br>Date<br>06/20/2025 |                              | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3) | ETTE_1 (ICP |               |
|------------------------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|------------------------------|---|-------------|---------------|
| <u>FROM</u>                        | 10.00000ml of M5873 + 10.00000ml | of M5874 +            | 80.00000ml c            | of MP85829 = F                   | Final Quantity: <sup>2</sup> | 100.000 ml                                    | A)          |               |
|                                    |                                  |                       |                         |                                  |                              |   |             |               |
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|                                    |                                  |                       |                         |                                  |                              |   |             |               |
| Recipe                             |                                  |                       |                         | Expiration                       | Prenared                     |   |             | Supervised By |

| Recipe |                                   |                |              | <b>Expiration</b> | <b>Prepared</b> |                |           | Supervised By   |
|--------|-----------------------------------|----------------|--------------|-------------------|-----------------|----------------|-----------|-----------------|
| ID     | NAME                              | <u>NO.</u>     | Prep Date    | <u>Date</u>       | <u>By</u>       | <u>ScaleID</u> | PipetteID | Sarabjit Jaswal |
| 3962   | MG 10PPM FOR TUNE                 | <u>MP85843</u> | 05/30/2025   | 06/20/2025        |                 | METALS_SCA     |           | -               |
|        |                                   |                |              |                   |                 | LE_3 (M SC-3)  |           | 06/14/2025      |
| FROM   | 0.01000ml of M6127 + 9.99000ml of | MP85829 =      | Final Quanti | ty: 100.000 ml    |                 |                | A)        |                 |
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| Recipe<br>ID<br>3894<br>FROM | NAME<br>TUNE 200PPB<br>2.00000ml of M6055 + 2.00000ml of | <u>NO.</u><br><u>MP85844</u><br>MP85843 +   | Prep Date<br>05/30/2025<br>96.00000ml d | Expiration<br>Date<br>06/20/2025 | Prepared<br>By<br>Janvi Patel<br>Final Quantity: | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)<br>100.000 ml | Sarabjit Jaswal<br>06/14/2025 |
|------------------------------|--|---|---|----------------------------------|--|---|-------------------------------|
| Recipe<br>ID<br>3903<br>FROM | NAME<br>ISS 3PPM<br>5.00000ml of M6162 + 75.00000ml o    | <u>NO.</u><br><u>MP85845</u><br>f M5739 + 1 | Prep Date<br>05/30/2025                 | Expiration<br>Date<br>06/20/2025 | Prepared<br>By<br>Janvi Patel                    | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3)<br>250.000 ml | Sarabjit Jaswal<br>06/14/2025 |



| <u>Recipe</u><br><u>ID</u> | NAME   | <u>NO.</u>     | Prep Date    | Expiration<br>Date | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u>              | <u>PipetteID</u>          | <u>Supervised By</u><br>Sarabjit Jaswal |
|----------------------------|--|----------------|--------------|--------------------|------------------------------|-----------------------------|---------------------------|---|
| 3880                       | M&B SPIKE-1  | <u>MP85846</u> | 05/30/2025   | 06/20/2025         | Janvi Patel                  | METALS_SCA<br>LE_3 (M SC-3) |                           | 06/14/2025                              |
| <u>FROM</u>                | 5.00000ml of M5471 + 5.00000ml of<br>of M5962 + 5.00000ml of M5981 + 5.<br>5.00000ml of M6079 + 5.00000ml of | .00000ml of    | M6021 + 5.00 | 0000ml of M602     | 23 + 5.00000ml               | of M6028 + 5.0              |                           |   |
| <u>Recipe</u><br>ID        | NAME   | NO.            | Prep Date    | Expiration<br>Date | <u>Prepared</u><br><u>By</u> | ScaleID                     | PipetteID                 | Supervised By                           |
| 3881                       | M&B SPIKE-2  | <u>MP85847</u> | 05/30/2025   | 06/20/2025         | Janvi Patel                  | METALS_SCA<br>LE_3 (M SC-3) | METALS_PIP<br>ETTE_1 (ICP | Sarabjit Jaswal<br>06/14/2025           |
| <u>FROM</u>                | 10.00000ml of M5942 + 10.00000ml<br>2.50000ml of M5799 + 2.50000ml of  |                |              |                    |                              |                             |                           | nl                                      |



| Recipe<br>ID<br>3882       | NAME<br>M&B SPIKE-3  | <u>NO.</u><br>MP85848 | Prep Date<br>05/30/2025 | Expiration<br>Date<br>06/20/2025 |                | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3) |                    | Sarabjit Jaswal                         |
|----------------------------|--|-----------------------|-------------------------|----------------------------------|----------------|---|--------------------|---|
| FROM                       | 0.62500ml of M6026 + 12.50000ml o<br>Final Quantity: 50.000 ml | f M5751 + 1           | 2.50000ml of            | M6128 + 12.50                    | 0000ml of M614 | 5 + 11.87500ml                                | A)<br>of MP85829 = | -                                       |
| <u>Recipe</u><br><u>ID</u> | NAME   | <u>NO.</u>            | Prep Date               | Expiration<br>Date               | Prepared<br>By | ScaleID                                       | PipettelD          | <u>Supervised By</u><br>Sarabjit Jaswal |

| <u>ID</u> | NAME                              | <u>NO.</u>     | Prep Date    | Date           | ВУ            | ScaleID          | PipetteiD            | Sarabjit Jaswal |
|-----------|-----------------------------------|----------------|--------------|----------------|---------------|------------------|----------------------|-----------------|
| 3900      | M&B SPIKE-4                       | <u>MP85849</u> | 05/30/2025   | 06/20/2025     |               | METALS_SCA       |                      |                 |
|           |                                   |                |              |                |               | LE_3 (M SC-3)    | • •                  | 06/14/2025      |
| FROM      | 6.25000ml of M6086 + 6.25000ml of | M6127 + 6.     | 25000ml of M | 6144 + 6.25000 | ml of MP85829 | ) = Final Quanti | A)<br>ity: 25.000 ml |                 |
|           |                                   |                |              |                |               |                  |                      |                 |
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| Recipe<br>ID<br>3965 | NAME<br>2:1 H2SO4 : HNO3         | <u>NO.</u><br>MP85892 | Prep Date<br>06/05/2025 | Expiration<br>Date<br>11/27/2025 | Prepared<br>By<br>Mohan Bera | <u>ScaleID</u><br>None | <u>PipetteID</u><br>None | Sarabjit Jaswal |
|----------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|------------------------------|------------------------|--------------------------|-----------------|
| FROM                 | 1600.00000ml of M6041 + 800.0000 | Dml of M616           | 2 = Final Qu            | antity: 3200.000                 | ) ml                         |                        |                          |                 |
| Basing               |                                  |                       |                         | Funitation                       | Draw and                     |                        |                          | Querencia ed Du |

| <b>Recipe</b> |                                       |                |                | Expiration      | <u>Prepared</u> |                             |           | Supervised By   |
|---------------|---------------------------------------|----------------|----------------|-----------------|-----------------|-----------------------------|-----------|-----------------|
| ID            | NAME                                  | <u>NO.</u>     | Prep Date      | <u>Date</u>     | <u>By</u>       | <u>ScaleID</u>              | PipetteID | Sarabjit Jaswal |
| 65            | POTASSIUM PERMANGANATE<br>SOLUTION 5% | <u>MP85893</u> | 06/05/2025     | 12/05/2025      | Mohan Bera      | METALS_SCA<br>LE_3 (M SC-3) |           | 06/14/2025      |
| FROM          | 100.00000gram of M4916 + 2000.00      | 000ml of W     | 3112 = Final ( | Quantity: 2000. | 000 ml          |                             |           |                 |
|               |                                       |                |                |                 |                 |                             |           |                 |
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| Recipe<br>ID<br>66 | NAME<br>POTASSIUM PERSULFATE<br>SOLUTION 5 % | <u>NO.</u><br>MP85894 | Prep Date<br>06/05/2025 | Expiration<br>Date<br>08/06/2025 |      | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3) | Sarabjit Jaswal |
|--------------------|--|-----------------------|-------------------------|----------------------------------|------|---|-----------------|
| FROM               | 100.00000ml of M4465 + 2000.0000             | Dml of W311           | 2 = Final Qu            | antity: 2000.000                 | D ml |   |                 |

| <u>Recipe</u><br><u>ID</u> | NAME   | <u>NO.</u>     | Prep Date     | Expiration<br>Date | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u>              | <u>PipetteID</u> | <u>Supervised By</u><br>Sarabjit Jaswal |
|----------------------------|--|----------------|---------------|--------------------|------------------------------|-----------------------------|------------------|---|
| 67                         | SODIUM CHLORIDE -<br>HYDROXYL- CHLORIDE      | <u>MP85895</u> | 06/05/2025    | 06/25/2025         |                              | METALS_SCA<br>LE_3 (M SC-3) |                  | 06/14/2025                              |
| <u>FROM</u>                | SOLUTION<br>2000.00000ml of W3112 + 240.0000 | Ogram of M₄    | 1371 + 240.00 | 000gram of M8      | 5884 = Final Qu              | uantity: 2000.00            | ) ml             |   |
|                            |  |                |               |                    |                              |                             |                  |   |
|                            |  |                |               |                    |                              |                             |                  |   |
|                            |  |                |               |                    |                              |                             |                  |   |
|                            |  |                |               |                    |                              |                             |                  |   |
|                            |  |                |               |                    |                              |                             |                  |   |
|                            |  |                |               |                    |                              |                             |                  |   |



| Recipe<br>ID<br>871 | NAME<br>MERCURY INTERMEDIATE B<br>250PPB WORKING STD. | <u>NO.</u><br>MP85915 | Prep Date<br>06/09/2025 | Expiration<br>Date<br>06/10/2025 | Prepared<br>By<br>Mohan Bera | <u>ScaleID</u><br>None | PipettelD<br>METALS_PIP<br>ETTE_5 (HG |  |
|---------------------|---|-----------------------|-------------------------|----------------------------------|------------------------------|------------------------|---------------------------------------|--|
| <u>FROM</u>         | 1.00000ml of M6162 + 2.50000ml of                     | M5062 + 96            | 5.50000ml of V          | V3112 = Final                    | Quantity: 100.00             | 00 ml                  | A)                                    |  |
|                     |   |                       |                         |                                  |                              |                        |                                       |  |
|                     |   |                       |                         |                                  |                              |                        |                                       |  |
|                     |   |                       |                         |                                  |                              |                        |                                       |  |
|                     |   |                       |                         |                                  |                              |                        |                                       |  |
|                     |   |                       |                         |                                  |                              |                        |                                       |  |

| <u>Recipe</u> |                                  |                |              | Expiration     | <b>Prepared</b> |                |            | <u>Supervised By</u> |
|---------------|----------------------------------|----------------|--------------|----------------|-----------------|----------------|------------|----------------------|
| <u>ID</u>     | NAME                             | <u>NO.</u>     | Prep Date    | <u>Date</u>    | <u>By</u>       | <u>ScaleID</u> | PipettelD  | Sarabjit Jaswal      |
| 1340          | Hg 0.00 PPB STD                  | <u>MP85916</u> | 06/09/2025   | 06/10/2025     | Mohan Bera      | None           | METALS_PIP |                      |
|               |                                  |                |              |                |                 |                | ETTE_5 (HG | 06/14/2025           |
| FROM          | 2.50000ml of M6162 + 247.50000ml | of W3112 =     | Final Quanti | ty: 250.000 ml |                 |                | A)         |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |
|               |                                  |                |              |                |                 |                |            |                      |



| Recipe<br>ID<br>1341<br>FROM | NAME<br>Hg 0.2 PPB STD<br>2.50000ml of M6162 + 247.30000ml | <u>NO.</u><br>MP85917<br>of W3112 + | Prep Date<br>06/09/2025<br>0.20000ml of | Expiration<br>Date<br>06/10/2025<br>MP85915 = F | Prepared<br>By<br>Mohan Bera<br>inal Quantity: 25 | ScaleID<br>None        | PipetteID<br>METALS_PIP<br>ETTE_5 (HG<br>A) | Supervised By<br>Sarabjit Jaswal<br>06/14/2025 |
|------------------------------|--|-------------------------------------|---|---|---|------------------------|---|--|
| Recipe<br>ID<br>1342<br>FROM | NAME<br>Hg 2.5 PPB STD                                     | <u>NO.</u><br><u>MP85918</u>        | Prep Date<br>06/09/2025                 | Expiration<br>Date<br>06/10/2025                | Prepared<br>By<br>Mohan Bera                      | <u>ScaleID</u><br>None | PipettelD<br>METALS_PIP<br>ETTE_5 (HG<br>A) | Sarabjit Jaswal<br>06/14/2025                  |



| Recipe<br>ID<br>1343<br>FROM       | NAME<br>Hg 5.0 PPB STD<br>2.50000ml of M6162 + 242.50000ml | <u>NO.</u><br>MP85919<br>of W3112 + | Prep Date<br>06/09/2025<br>5.00000ml of | <u>Expiration</u><br><u>Date</u><br>06/10/2025<br>MP85915 = F | Prepared<br>By<br>Mohan Bera<br>nal Quantity: 25 |                        | PipetteID<br>METALS_PIP<br>ETTE_5 (HG<br>A)  | Supervised By<br>Sarabjit Jaswal<br>06/14/2025 |
|------------------------------------|--|-------------------------------------|---|---|--|------------------------|--|--|
| <u>Recipe</u><br><u>ID</u><br>1344 | NAME<br>Hg 7.5 PPB STD                                     | <u>NO.</u><br>MP85920               | <u>Prep Date</u><br>06/09/2025          | Expiration<br>Date<br>06/10/2025                              | Prepared<br>By<br>Mohan Bera                     | <u>ScaleID</u><br>None | <u>PipetteID</u><br>METALS_PIP<br>ETTE_5 (HG | Sarabjit Jaswal                                |



| <u>Recipe</u><br><u>ID</u><br>1345 | NAME<br>Hg 10.0 PPB STD          | <u>NO.</u><br>MP85921 | Prep Date<br>06/09/2025 | Expiration<br>Date<br>06/10/2025 | Prepared<br>By<br>Mohan Bera | <u>ScaleID</u><br>None | PipettelD<br>METALS_PIP<br>ETTE_5 (HG | Sarabjit Jaswal                         |
|------------------------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|------------------------------|------------------------|---------------------------------------|---|
| FROM                               | 2.50000ml of M6162 + 237.50000ml | of W3112 +            | 10.00000ml c            | of MP85915 =                     | Final Quantity: 2            | 250.000 ml             | A)                                    |   |
|                                    |                                  |                       |                         |                                  |                              |                        |                                       |   |
|                                    |                                  |                       |                         |                                  |                              |                        |                                       |   |
|                                    |                                  |                       |                         |                                  |                              |                        |                                       |   |
| Recipe                             |                                  | <u>NO.</u>            | Prep Date               | Expiration<br>Date               | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u>         | PipettelD                             | <u>Supervised By</u><br>Sarabjit Jaswal |

|             |                                   |              |               |               |                  |        |            | Sarabjit Jaswal |
|-------------|-----------------------------------|--------------|---------------|---------------|------------------|--------|------------|-----------------|
| 1346        | Hg ICV SOLUTION                   | MP85922      | 06/09/2025    | 06/10/2025    | Mohan Bera       | None   | METALS_PIP |                 |
|             |                                   |              |               |               |                  |        | ETTE_5 (HG | 06/14/2025      |
|             | 2 5000ml of M0101 + 2 50000ml of  |              |               |               |                  | 000    | - A) ·     |                 |
| <u>FROM</u> | 2.50000ml of M6161 + 2.50000ml of | INI6162 + 24 | 15.00000mi of | 103112 = Fina | I Quantity: 250. | 000 mi |            |                 |
|             |                                   |              |               |               |                  |        |            |                 |
|             |                                   |              |               |               |                  |        |            |                 |
|             |                                   |              |               |               |                  |        |            |                 |
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|             |                                   |              |               |               |                  |        |            |                 |
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|             |                                   |              |               |               |                  |        |            |                 |
|             |                                   |              |               |               |                  |        |            |                 |
|             |                                   |              |               |               |                  |        |            |                 |



| <u>Recipe</u><br><u>ID</u><br>1351 | NAME<br>ICB (Hg 0.00 PPB SOLUTION) | <u>NO.</u><br>MP85923 | <u>Prep Date</u><br>06/09/2025 | Expiration<br>Date<br>06/10/2025 | Prepared<br>By<br>Mohan Bera | <u>ScaleID</u><br>None | PipettelD<br>METALS_PIP<br>ETTE_5 (HG |               |
|------------------------------------|------------------------------------|-----------------------|--------------------------------|----------------------------------|------------------------------|------------------------|---------------------------------------|---------------|
| FROM                               | 2.50000ml of M6162 + 247.50000ml   | of W3112 =            | Final Quantit                  | y: 250.000 ml                    |                              |                        | A)                                    |               |
|                                    |                                    |                       |                                |                                  |                              |                        |                                       |               |
|                                    |                                    |                       |                                |                                  |                              |                        |                                       |               |
|                                    |                                    |                       |                                |                                  |                              |                        |                                       |               |
| Recipe                             | NAME                               | NO                    | Pron Date                      | Expiration                       | Prepared<br>By               | ScaleID                | PinettelD                             | Supervised By |

| Recipe |                                  |                |              | <b>Expiration</b> | <b>Prepared</b>   |                |                  | Supervised By   |
|--------|----------------------------------|----------------|--------------|-------------------|-------------------|----------------|------------------|-----------------|
| ID     | NAME                             | <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)        | <u>MP85924</u> | 06/09/2025   | 06/10/2025        | Mohan Bera        | None           | METALS_PIP       |                 |
|        |                                  |                |              |                   |                   |                | ETTE_5 (HG       | 06/14/2025      |
| FROM   | 485.00000ml of W3112 + 5.00000ml | of M6162 +     | 10.00000ml c | of MP85915 =      | Final Quantity: 5 | 500.000 ml     | A)               |                 |
|        |                                  |                |              |                   |                   |                |                  |                 |
|        |                                  |                |              |                   |                   |                |                  |                 |
|        |                                  |                |              |                   |                   |                |                  |                 |
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|        |                                  |                |              |                   |                   |                |                  |                 |
|        |                                  |                |              |                   |                   |                |                  |                 |
|        |                                  |                |              |                   |                   |                |                  |                 |



| Recipe<br>ID<br>1352       | NAME<br>CCB (Hg 0.00 PPB SOLUTION) | <u>NO.</u><br>MP85925 | Prep Date<br>06/09/2025 | Expiration<br>Date<br>06/10/2025 | Prepared<br>By<br>Mohan Bera | <u>ScaleID</u><br>None | PipettelD<br>METALS_PIP<br>ETTE_5 (HG |   |
|----------------------------|------------------------------------|-----------------------|-------------------------|----------------------------------|------------------------------|------------------------|---------------------------------------|---|
| <u>FROM</u>                | 495.00000ml of W3112 + 5.00000ml   | of M6162 =            | Final Quantit           | y: 500.000 ml                    |                              |                        | A)                                    |   |
|                            |                                    |                       |                         |                                  |                              |                        |                                       |   |
|                            |                                    |                       |                         |                                  |                              |                        |                                       |   |
|                            |                                    |                       |                         |                                  |                              |                        |                                       |   |
| <u>Recipe</u><br><u>ID</u> | NAME                               | <u>NO.</u>            | Prep Date               | Expiration<br>Date               | <u>Prepared</u><br><u>By</u> | <u>ScaleID</u>         | <u>PipetteID</u>                      | <u>Supervised By</u><br>Sarabjit Jaswal |

### 1349 CRA/CRI (Hg 0.2 PPB SOLUTION) MP85926 06/09/2025 06/10/2025 Mohan Bera None METALS\_PIP ETTE\_5 (HG 06/14/2025 FROM 2.50000ml of M6162 + 245.00000ml of W3112 + 2.50000ml of MP85915 = Final Quantity: 250.000 ml A) A)



FROM

### Metals STANDARD PREPARATION LOG

| Recipe<br>ID<br>1350<br>FROM | NAME<br>CHK STD (Hg 7.0 PPB<br>SOLUTION)<br>2.50000ml of M6162 + 240.50000ml | <u>NO.</u><br><u>MP85927</u><br>of W3112 + | Prep Date<br>06/09/2025<br>7.00000ml of | Expiration<br>Date<br>06/10/2025<br>MP85915 = F | Prepared<br><u>By</u><br>Mohan Bera<br>inal Quantity: 24 | <u>ScaleID</u><br>None<br>50.000 ml           | PipettelD<br>METALS_PIP<br>ETTE_5 (HG<br>A) |                               |
|------------------------------|--|--|---|---|--|---|---|-------------------------------|
| Recipe<br>ID<br>68           | NAME<br>STANNOUS CHLORIDE<br>SOLUTION  | <u>NO.</u><br>MP85932                      | Prep Date<br>06/10/2025                 | Expiration<br>Date<br>06/11/2025                |  | <u>ScaleID</u><br>METALS_SCA<br>LE_3 (M SC-3) |   | Sarabjit Jaswal<br>06/14/2025 |

450.00000ml of W3112 + 50.00000gram of M4920 + 50.00000ml of M6151 = Final Quantity: 500.000 ml



### CHEMICAL RECEIPT LOG BOOK

| 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         | 07/01/2019 /<br>RICHARD    | 06/07/2019 /<br>RICHARD        | M4371             |
| 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 /<br>jaswal     | 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 # |
| 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             |
| 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)                          | 210800       | 03/31/2026         | 05/28/2022 /<br>mohan      | 07/28/2021 /<br>mohan          | M4920             |
| 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 # |
| Inorganic<br>Ventures | 6020CAL-1 / Calibration<br>Standard Method 6020                        | S2-MEB711244 | 10/20/2026         | 03/07/2025 /<br>JANVI      | 04/01/2022 /<br>jaswal         | M5305             |



| 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         | 04/14/2025 /<br>jaswal     | 03/16/2023 /<br>jaswal         | M5471             |
| Supplier                    | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57119 / Potassium (K)<br>10,000PPM                                | 120822       | 12/08/2025         | 08/01/2024 /<br>Jaswal     | 03/17/2023 /<br>bin            | M5520             |
| 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 # |
| Inorganic<br>Ventures       | 6020ISS / 6020ISS, 10<br>ug/ml, Bi, Ho, In, 6Li, Rh,<br>Sc, TB, Y | T2-MEB709511 | 09/03/2026         | 08/07/2024 /<br>jaswal     | 04/11/2022 /<br>jaswal         | M5739             |
| Supplier                    | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 58029 / Cu, 1000 PPM,<br>500 ml                                   | 071723       | 07/17/2026         | 10/01/2024 /<br>Jaswal     | 08/25/2023 /<br>jaswal         | M5751             |
| Supplier                    | ItemCode / ItemName   | Lot #        | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |

| Supplier                    | ItemCode / ItemName             | Lot #  | Date       | Opened By           | Received Date /<br>Received By | Lot # |
|-----------------------------|---------------------------------|--------|------------|---------------------|--------------------------------|-------|
| Absolute<br>Standards, Inc. | 57004 / Be, 1000 PPM,<br>125 ml | 102523 | 10/25/2026 | 02/09/2024 /<br>bin | 02/09/2024 /<br>bin            | M5798 |
|                             |                                 |        |            |                     |                                |       |



| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 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<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57033 / As, 1000 PPM,<br>125 ml  | 111323 | 11/13/2026         | 02/09/2024 /<br>bin        | 02/09/2024 /<br>bin            | M5801             |
| Supplier                    | ItemCode / ItemName              | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<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 /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57115 / P, 10000 PPM,<br>125 ml  | 041723 | 04/17/2026         | 05/21/2024 /<br>Jaswal     | 02/09/2024 /<br>jaswal         | M5815             |

| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<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             |



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### CHEMICAL RECEIPT LOG BOOK

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| Supplier                    | ItemCode / ItemName                                      | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|--|-----------------|--------------------|----------------------------|--------------------------------|-------------------|
| EPA                         | PART A / ICSA ( ICPMS )<br>STOCK SOLN                    | CP-MS ICSA-0803 | 06/30/2025         | 04/17/2024 /<br>jaswal     | 07/14/2022 /<br>jaswal         | M5873             |
| Supplier                    | ItemCode / ItemName                                      | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| EPA                         | PART B / ICSB (ICPMS)<br>STOCK SOLUTION                  | CP-MS ICSB-0803 | 06/30/2025         | 04/17/2024 /<br>jaswal     | 07/14/2022 /<br>jaswal         | M5874             |
| 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 # |
| Inorganic<br>Ventures       | CGTI1-1 / TITANIUM<br>125mL 1000ug/mL                    | T2-TI719972     | 06/17/2027         | 06/18/2024 /<br>Jaswal     | 02/22/2024 /<br>Jaswal         | M5942             |
| Supplier                    | ItemCode / ItemName                                      | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57028 / Ni, 1000 PPM, 125<br>ml                          | 041124          | 04/11/2027         | 07/02/2024 /<br>Jaswal     | 06/11/2024 /<br>Jaswal         | M5961             |
| Supplier                    | ItemCode / ItemName                                      | Lot #           | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57034 / Se, 1000 PPM,<br>125 ml                          | 060624          | 06/06/2027         | 07/02/2024 /<br>Jaswal     | 06/14/2024 /<br>Jaswal         | M5962             |



Standards, Inc.

125 ml

### CHEMICAL RECEIPT LOG BOOK

| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|--|-------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic<br>Ventures       | CGMO1-1 /<br>MOLYBDENUM 125mL<br>1000ug/mL | T2-MO720876 | 07/17/2027         | 01/16/2025 /<br>JANVI      | 02/22/2024 /<br>Jaswal         | M5977             |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57092 / U, 1000 PPM, 125<br>ml             | 060724      | 06/07/2027         | 07/29/2024 /<br>Jaswal     | 06/11/2024 /<br>Jaswal         | M5981             |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57023 / V, 1000 PPM, 125<br>ml             | 062424      | 06/24/2027         | 09/28/2024 /<br>jaswal     | 08/05/2024 /<br>Jaswal         | M6021             |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57081 / TI, 1000 PPM, 125<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. | 57082 / Pb, 1000 PPM,<br>125 ml            | 061224      | 11/09/2026         | 08/05/2024 /<br>Jaswal     | 08/05/2024 /<br>Jaswal         | M6025             |
| Supplier                    | ItemCode / ItemName                        | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute                    | 57182 / Pb, 10000 PPM,                     | 110923      | 11/09/2026         | 12/05/2024 /               | 08/05/2024 /                   | M6026             |

janvi

Jaswal



| 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 | 070124 07/01/2027 k |                            | 08/05/2024 /<br>Jaswal         | M6028             |
| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<br>Date  | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57047 / Ag, 1000 PPM,<br>125 ml | 122823 | 12/28/2026          | 08/05/2024 /<br>kareem     | 08/05/2024 /<br>Jaswal         | M6030             |
| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<br>Date  | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute<br>Standards, Inc. | 57056 / Ba, 1000 PPM,<br>125 ml | 010924 | 01/09/2027          | 01/14/2025 /<br>Jaswal     | 08/05/2024 /<br>Jaswal         | M6032             |

| 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             |
|                  |  |            |                    |                            |                                |                   |

| ItemCode / ItemName | Lot #                | Expiration<br>Date                                    | Date Opened /<br>Opened By   | Received Date /<br>Received By  | Chemtech<br>Lot #  |
|---------------------|----------------------|---|--|---|--|
| TUNING SOLUTION,    | U2-MEB734294         | 06/21/2028  | 08/21/2024 /<br>Jaswal   | 08/19/2024 /<br>Jaswal  | M6055  |
|                     | IV-STOCK-12 / ICP-MS | IV-STOCK-12 / ICP-MS U2-MEB734294<br>TUNING SOLUTION, | ItemCode / ItemNameLot #DateIV-STOCK-12 / ICP-MS<br>TUNING SOLUTION,U2-MEB73429406/21/2028 | ItemCode / ItemNameLot #DateOpened ByIV-STOCK-12 / ICP-MS<br>TUNING SOLUTION,U2-MEB73429406/21/202808/21/2024 /<br>Jaswal | ItemCode / ItemNameLot #DateOpened ByReceived ByIV-STOCK-12 / ICP-MS<br>TUNING SOLUTION,U2-MEB73429406/21/202808/21/2024 /<br>Jaswal08/19/2024 /<br>Jaswal |

| Supplier                    | ItemCode / ItemName             | Lot #  | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 57040 / Zr, 1000 PPM, 125<br>ml | 071423 | 07/14/2026         | 01/15/2025 /<br>Jaswal     | 09/30/2024 /<br>Jaswal         | M6079             |
|                             |                                 |        |                    |                            |                                |                   |



| 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 / Calcium, 500 ml,<br>10000 PPM | 082324      | 08/23/2027         | 03/06/2025 /<br>JANVI      | 10/14/2024 /<br>jaswal         | M6086             |
| 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      | 112124      | 11/21/2027         | 01/13/2025 /<br>kareem     | 01/13/2025 /<br>kareem         | M6127             |
| 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 # |
| Absolute<br>Standards, Inc.                               | 58119 / K, 10000 PPM,<br>500 ml       | 103024      | 10/30/2027         | 05/06/2025 /<br>JANVI      | 01/13/2025 /<br>Jaswal         | M6142             |
| Supplier  | ItemCode / ItemName                   | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Absolute 58111 / Na, 10000 PPM,<br>Standards, Inc. 500 ml |                                       | 072424      | 07/24/2027         | 01/23/2025 /<br>kareem     | 01/13/2025 /<br>Jaswal         | M6144             |



| Supplier                    | ItemCode / ItemName   | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
|-----------------------------|---|-------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute<br>Standards, Inc. | 58030 / Zinc, Zn, 500 ml,<br>1000 PPM                             | 121724      | 12/17/2027         | 02/04/2025 /<br>jaswal     | 01/13/2025 /<br>Jaswal         | M6145             |
| 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             |
| Supplier                    | ItemCode / ItemName   | Lot #       | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Inorganic<br>Ventures       | CGSR10 / Strontium (SR),<br>125mL 10,000ppm                       | V2-SR754329 | 02/28/2026         | 02/28/2025 /<br>JANVI      | 01/07/2025 /<br>JANVI          | M6153             |
| 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. | 58113 / Al, 10000 PPM,<br>500 ml                                  | 011325      | 03/18/2026         | 03/18/2025 /<br>kareem     | 02/09/2025 /<br>kareem         | M6159             |



| 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              | 07/17/2027         | 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 # |
| EPA                         | PA ICV-5 / ICV (HG)STOCK<br>SOLN                         |                     | 07/31/2025         | 05/01/2025 /<br>mohan      | 03/30/2024 /<br>mohan          | M6161             |
| 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) | 24H0162012          | 11/27/2025         | 05/27/2025 /<br>Sagar      | 04/27/2025 /<br>Sagar          | M6162             |
| Supplier                    | ItemCode / ItemName                                      | Lot #               | Expiration<br>Date | Date Opened /<br>Opened By | Received Date /<br>Received By | Chemtech<br>Lot # |
| Seidler Chemical            | DIW / DI Water   | Daily Lab-Certified | 07/03/2029         | 07/03/2024 /<br>Iwona      | 07/03/2024 /<br>Iwona          | W3112             |

| m/z->  | N.<br>5<br>11<br>0 | m/≥-≫<br>5.0⊑6 | m/z-><br>2.0回5<br>1.0回5 | 2.0<br>同の<br>の                        | 1. Barium nitrate (Ba) | Compound  | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below wa                     | CERTIFIED WEIGHT REPORT:<br>Part A<br>Lot A<br>Desc         | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|--------|--------------------|----------------|-------------------------|---------------------------------------|------------------------|---|--|---|--|
| N      |                    | 110            | 10                      | [1] Spectrum No.1                     | IN02                   | RM#   | Expiration Date:010927Recommended Storage:Ambient (Il Concentration (µg/mL):1000NIST Test Number:6UTBWeight shown below was diluted to (mL): | <u>PORT:</u><br>Part Number:<br>Lot Number:<br>Description: | om om  |
| ນ<br>ວ |                    | 120            | N<br>O                  |                                       | IN023 BAD022019A1 1    | Lot<br>Number   | 20   | <u>57056</u><br>010924<br>Barium (Ba)                       |  |
| ).     |                    | 130            | Q<br>O                  | 12.514 sec]:58156.D# [Count] [Linear] | 1000 99.999            | Nominal Purity Unc<br>Conc. (µg/mL) (%) Pu  | 5E-05<br>00.02   |   | R1815  |
| 240    |                    | 140            | <b>4</b><br>0           | 56. D# [Cour                          | 0.10 52.3 3            | Uncertainty Assay<br>Purity (%) (%) W   | 2%<br>Balance Uncertainty<br>Flask Uncertainty   |   | ertified Refere<br>१२-५  |
|        |                    | 150 160        | 0<br>0<br>0             | t] [Linear]                           | 3.82417 3.82441        | Target Actual<br>Weight (g) Weight (g)  | 40.0 Nitric Acid<br>(mL)   | 46  | Certified Reference Material CRM<br>1/2-4  |
| I      |                    | 0 170          | 70                      |                                       | 1 1000.1               | Actual<br>Conc. (µg/mL)   |  |   | <b>:RM</b><br>М6032  |
|        |                    | 180            | 8-<br>0                 |                                       | 2.0 10022-31-8         | Expanded<br>Uncertainty (So<br>+/- (µg/mL) CAS#                                   | Formulated By:   | Hiovanni  | -  |
|        |                    | 190 Varian     | 9<br>O                  |                                       | 0.5 mg/m3              | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br>COSHA PEL (TWA) LD51 | Giovanni Esposito  |   | AI<br>Al   |
|        |                    | 200            | 100                     |                                       | orl-rat 355 mg/kg      | n Attached pg.)<br>) LD50   | 010924   | (P)   | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|        |                    |                |                         |                                       | g 3104a                | NIST  | <u>2</u> [2]   | <u> </u>  | Accredited<br>Ite Number<br>Idards.com   |

Printed: 8/1/2024, 2:13:18 PM

**Certified Reference Material CRM** 



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

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

|                      | b  | a ĝ    | į            |              | д <sup>1</sup> | As    | Sb    |       |   | I       |          |
|----------------------|--|--------|--------------|--------------|----------------|-------|-------|-------|---|---------|----------|
| i di                 | <u.u2< td=""><td>40.02</td><td>10.02</td><td>2</td><td>-</td><td>40.2</td><td>&lt;0.02</td><td>20.02</td><td></td><td></td><td></td></u.u2<> | 40.02  | 10.02        | 2            | -              | 40.2  | <0.02 | 20.02 |   |         |          |
|                      | ŝ  | ی<br>د | 2            | , s          | ? !            | ç     | ß     | ß     |   |         |          |
|                      | AU.02  | <0.02  | <0.02        | 0.02         |                | <0 02 | <0.2  | <0.02 |   |         |          |
|                      | Au   | ଜୁ     | Ga           | g            | 5              | 13    | 막     | Dy    |   |         |          |
|                      | 40.02  | <0.02  | <0.02        | 20.02        | 0.02           | 23    | A0.02 | <0.02 | And the second second                   |         |          |
|                      | Pb   | La     | Fe           | I            | • #            | , s   | Но    | Hf    |   |         |          |
|                      | <0.02  | <0.02  | 40.2         | <0.02        | 20.02          | 3     | 40.02 | <0.02 | THAN A MUT AND IN ST                    |         | Trane Mi |
|                      | Nd   | Mo     | Hg           | Mn           | atvi a         | 5     | E     | Ľ     | E NEWL                                  | Stalo   | stale    |
| (T) = Target analyte | <0.02  | <0.02  | <b>∆0.</b> 2 | <0.02        | 10.05          |       | 40.02 | <0.02 | I CALLARD AND AND                       |         | Varifing |
| get ana              | ĸ  | ₽      | P            | Pd           | ç              |       | Ş     | Ni    | and the second                          |         |          |
| yte                  | 40.2   | <0.02  | <0.02        | <0.02        | <0.02          |       | 3     | <0.02 | 日本の                                     | by iCF- |          |
|                      | Sc   | Sm     | Ru           | Rb           | Kh             | ! ₹   | D.    | P     | 11 11                                   | NO CIM  |          |
|                      | <0.02  | <0.02  | 40.02        | <0.02        | <0.02          | 10.01 | 3     | <0.02 | No. of the local division of the        | haver)  |          |
|                      | Ta   | ŝ      | ş            | Na           | Ag             | 2     | 2     | Se    |   |         |          |
|                      | <0.02  | <0.02  | <0.02        | <b>~0</b> .2 | <0.02          | 20.02 | 3     | <0.2  | CONTRACTOR OF THE OWNER.                |         |          |
|                      | 티  | Sn     | H<br>B       | 7            | H              | Ic    | 3     | Ţ     | No INTERNO                              |         |          |
|                      | <0.02  | 40.02  | 40.02        | 40.02        | 40.02          | <0.02 | 10.01 | c0 03 |   |         |          |
|                      | 2  | , K    | <            | \$           | <              | c     | 1 :   | W     |   |         |          |
|                      | <0.02  | A 103  | 48           | <0.02        | <0.02          | 20.02 | 20.02 | 000   | AND |         |          |

## **Physical Characterization:**

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

in P. S.

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 # 57056 Lot # 010924

| Part # 58120 Lot #              | m/z-> | а.<br>СП-4 | 1.065 | m/z->   | N.55<br>114 | 5.0E4 | FT/Z->> | 1.0E4 | 2.004                                 | 1. Calcium carbonate (Ca) | Compound   | Weight shown                            | Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Text Number | Expira                   | Part<br>Lot<br>De  | CERTIFIED WEIGHT REPORT: | TTTT TADOOLOGICOLALIONAL SOLO | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com |
|---------------------------------|-------|------------|-------|---------|-------------|-------|---------|-------|---------------------------------------|---------------------------|--|---|--|--------------------------|--|--------------------------|-------------------------------|---|
| Lot # 082324                    | N     |            |       | 1 10    |             |       | 10      |       | [1] Spectrum No. 1                    | IN014 CAD032023B3         | RM# Nu   | Weight shown below was diluted to (mL): |  |                          | Part Number: 58120<br>Lot Number: 082324<br>Description: Calciun |                          |                               | s, Inc.   |
|                                 | 220   |            |       | 120 130 |             |       | 20 30   |       |                                       | 10000                     | Lot Nominal P<br>Number Conc. (µg/mL) (  | 4000.1                                  | 0°02) w  | 327                      | <u>58120</u><br>082324<br>Calcium (Ca)                           |                          | Rev                           | V   |
|                                 | 240   |            |       | 140     |             |       | 40      |       | 12.514 sec]:58120.Dŵ [Count] [Linear] | 99.999 0.10 39.9          | Purity Uncertainty Assay<br>(%) Purity (%) (%)                                     | 0.15 Flask Uncertainty                  | SE-05 Belonce Horsetsinty  | 2%                       | Solvent  |                          | Revel = 10/14/2024            | Certified Ref   |
| 1 of 2                          | 250   |            |       | 150     |             |       | 50      |       | ount] [Linear]                        | 100.2537 100.2656         | Target Actual<br>Weight (g) Weight (g)   |   |  | 80.0 Nitric Acid<br>(mL) | 46   | Lot #                    | M GOSS / M                    | Certified Reference Material CRM                                      |
|                                 | 280   |            |       | 160 170 |             |       | 60 70   |       |                                       | 656 <b>10001.2</b>        | Actual<br>Conc. (µg/mL)  | [                                       | <u>n</u>   |                          |  | 1                        | 1 M 6 08 6 / M 6 087          | CRM   |
| Prir                            |       |            |       | 031     |             |       | 80      |       |                                       | 20.0 471-34-1             | Expanded<br>Uncertainty (Solve<br>+/- (µg/mL) CAS#                                 |   | Reviewed By:   | Formulated By:           | wie  |                          | 4<br>4                        |   |
| Printed: 10/10/2024, 5:43:17 PM |       |            |       | 190     |             |       | 90 1    |       |                                       | 5 mg/m3                   | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD50 | CALLS INT LEAST LEAST                   | Derlin   Rentas  | Giovanni Esposito        | Capedio  |                          | nups.//                       | ANAE<br>AR-1  |
| 43:17 PM                        |       |            |       | 200     |             |       | 100     |       |                                       | ort-rat >2000mg/kg 3109a  | ached pg.) NIST<br>LD50 SRM  |   | 082324   | 082324                   |  |                          | nttps://Absolutestandards.com | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number               |

| Printed: 10/10/20  | Part # 58120 Lot # 082324 2 of 2 | <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>* 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.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* 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).</li> </ul> | Homogeneity: No heterogeneity was observed in the preparation of this standard. | Physical Characterization: | (T) = Target analyte | AI         -40/02         Cul         -40/02         Dy         -40/02         Hf         -40/02         Li         -40/02         Ni         -40/02           Sb         -40/02         Ca         T         Er         -40/02         Hn         -40/02         Lu         -40/02         Nb         -40/02 </th <th>Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):<br/>Trace Metals Verification by ICP-MS</th> <th>Absolute Standards, Inc.<br/>800-368-1131<br/>www.absolutestandards.com</th> | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):<br>Trace Metals Verification by ICP-MS | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                       |
|--|----------------------------------|--|---|----------------------------|----------------------|--|--|---|
| 3 Certifi           3 Solutest           3 0 02           3 02           3 | Printed: 10/10/2024, 5:43:17 PM  | s otherwise stated.<br>laterials are used in<br>(see above).<br>ertainty of NIST<br>994).  | For P. S.   | Certified by:              |                      | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 1 T 1 T 1  | RM ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

| m/z-> | 1.067 | m/z-><br>2.0€7 | 5.014 | m/z-≻<br>1.0E5 | 2.5<br>4 | 5.0而4                                 | 1. Cadmium nitrate tetrahydrate (Cd) | Compound   | Weight shov  | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): |   | CERTIFIED WEIGHT REPORT: | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|-------|-------|----------------|-------|----------------|----------|---------------------------------------|--------------------------------------|--|--|--|---|--------------------------|--|
|       |       | <br>           |       | 0              |          | [1] Spectrum No.1                     |                                      | RM#  | Weight shown below was dliuted to (mL):              | Expiration Date:<br>nended Storage:<br>ntration (µg/mL):                   | Part Number:<br>Lot Number:<br>Description:   | PORT:                    | <b>15, Inc.</b><br>om  |
|       |       | 120            |       | Š              |          | -                                     | IN024 CDM092021A1                    | Lot<br>Number  | 6UTB<br>uted to (mL):                                | 070127<br>Ambient (20 °C)<br><b>1000</b>                                   | <u>57048</u><br><u>070124</u><br>Cadmium (Cd) |                          |  |
|       |       | 130            |       | 30<br>0        |          | 12.514 500                            | 1000 99.                             | Nominal Pu<br>Conc. (µg/mL) (1   | 2000.07 0.1  |  | (Cd)  |                          | R  |
| 200   |       | 140            |       | <b>À</b>       |          | 12.514 sec]:58148.D# [Count] [Linear] | 99.999 0.10 36.5                     | Purity Uncertainty Assay<br>(%) Purity (%) (%)                                     | 5E-05 Balance Uncertainty<br>0.100 Flask Uncertainty |  | Solvent:<br>2%                                |                          | Certified R  |
|       |       | 1<br>()<br>()  |       | 50             |          | Count) [Line                          | .5 5.4797                            | say Target<br>6) Weight (g)  | ţ  |  | ent: 24002546<br>2% 40.0                      | Lot #                    | Certified Reference Material CRM<br>3 15 12 4  |
|       |       | 160            |       | 0<br>0         |          | ar'j                                  | 5.4804                               | Actual Actual<br>Weight (g) Conc. (µg/mL)  |  |  | Nitric Acid                                   |                          | terial CRM   |
|       |       | 170            |       | 70             |          |                                       | 1000.1                               | 11   | Re   | 5  | 5   |                          | M6028  |
|       |       | -1 2<br>C      |       | BO             |          |                                       | 10022-68-1                           | Expanded<br>Uncertainty (Solvent<br>+/- (µg/mL) CAS# 0                             | Reviewed By: Ped                                     | \$   | Alloch & B                                    |                          | -  |
|       |       | 190 200        |       | 90 100         |          |                                       |                                      | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD51 | Pedro L. Rentas                                      | ento   | Brack   |                          | ANAB IS<br>AR-153<br>https://Ab  |
|       |       |                |       | -              |          |                                       | orl-rat 60.2mg/kg 3108               | hed pg.) NIST<br>LD50 SRM  | 070124   |  | 070194  |                          | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

1 of 2

Part # 57048

Lot # 070124

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

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

|                      | F        | 7     | B          | DC    |  | Ra    | AS               | - 00  | ç     | A     |                                 | I       |       |
|----------------------|----------|-------|------------|-------|--|-------|------------------|-------|-------|-------|---------------------------------|---------|-------|
|                      | 10:04    | 202   | <0.02      | 10.0> | 10.01  | 3     | 202              | 10.02 | 200   | <0.02 | CONTRACTOR OF A DATE            |         |       |
|                      | <u>_</u> | 2     | S          | ភ្    | s ç  | ç     | ç                | 2     | 2     | 8     |                                 |         |       |
|                      | 70.02    |       | 40.02      | <0.02 | 20.02  | 3     | <0.02            |       | 5     | H     | STOCK STOCK                     |         |       |
|                      | - Au     |       | ş          | Ga    | 2  | 5     | ę                | C     | Į,    | Ð     | 0.01                            |         |       |
|                      | <0.02    |       | 3          | <0.02 | <u.u2< td=""><td>3</td><td>40.02</td><td>20.02</td><td>2</td><td>&lt;0.02</td><td>20110-000-050 M</td><td></td><td></td></u.u2<> | 3     | 40.02            | 20.02 | 2     | <0.02 | 20110-000-050 M                 |         |       |
|                      | 12       | 2     | 2          | 2     | H  | 7     | 5                | HO    | :     | Hf    | Sold and                        |         |       |
|                      | 40.02    | 10.02 | 55         | ~0,2  | <0.02  | 2     | ∆.02             | <0.02 |       | 40.02 | A Star & Star                   |         | -     |
|                      | Nd       | UTAT  | Ş,         | Hg    | Mn   | ί,    | Me               | Ę     | •     | E     | CONTRACT                        | ie cais | +30   |
| (T) = Target analyte | <0.02    | 20.02 | 200        | 40.2  | <0.02  |       | <b>&lt;0</b> .01 | <0.02 |       | 40.02 | ALL STREET                      | VCITICO | くうどれい |
| let anal             | ×        | 2     | 2          | ð     | Pd   | ! !   | õ                | Nb    |       | N:    | The second second               |         | +:))  |
| vte                  | 4012     | 20.02 | 3          | A0.02 | <0.02  |       | <0.02            | <0.02 | 10.02 | c0 0> | 一般であるの                          | DY ICF- | 55    |
|                      | Sc       | Ň     | 2          | R     | Rb   |       | R                | Re    |       | ę     |                                 | C CIM   |       |
|                      | 40.02    | 20.02 |            | 40.02 | <0.02  | 10.00 | 300              | <0.02 | 10.04 | con   |                                 | ug/mL)  |       |
|                      | Ta       | s.    | , <u>,</u> | ş     | Na   | 9.0   | A۵               | 2     | 00    | 2     | SUMPLICATION OF                 |         |       |
|                      | A0,02    | <0.02 |            | 2003  | <0.2   | 10.01 | 33               | <0.02 | 10.4  | 3     | THE REPORT OF A                 |         |       |
|                      | IJ.      | Sa    |            | Ì     | Ţ,   |       | 3                | Te    | 01    |       |                                 |         |       |
|                      | <0.02    | <0.02 | 10.04      | 50    | <0.02  | 10.02 | 3                | <0.02 | 20.05 | 200   |                                 |         |       |
|                      | 27       | 2     | ÷          | <     | 4  | v     | 4                | d     | ×     |       | Constant of the                 |         |       |
|                      | <0.02    | <0.02 | 20.02      | 3     | <0.02  | 20.02 | 3                | 40.02 | 20.02 |       | Strengt Strengt Strengt Strengt |         |       |

## Physical Characterization:

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

In P. St.

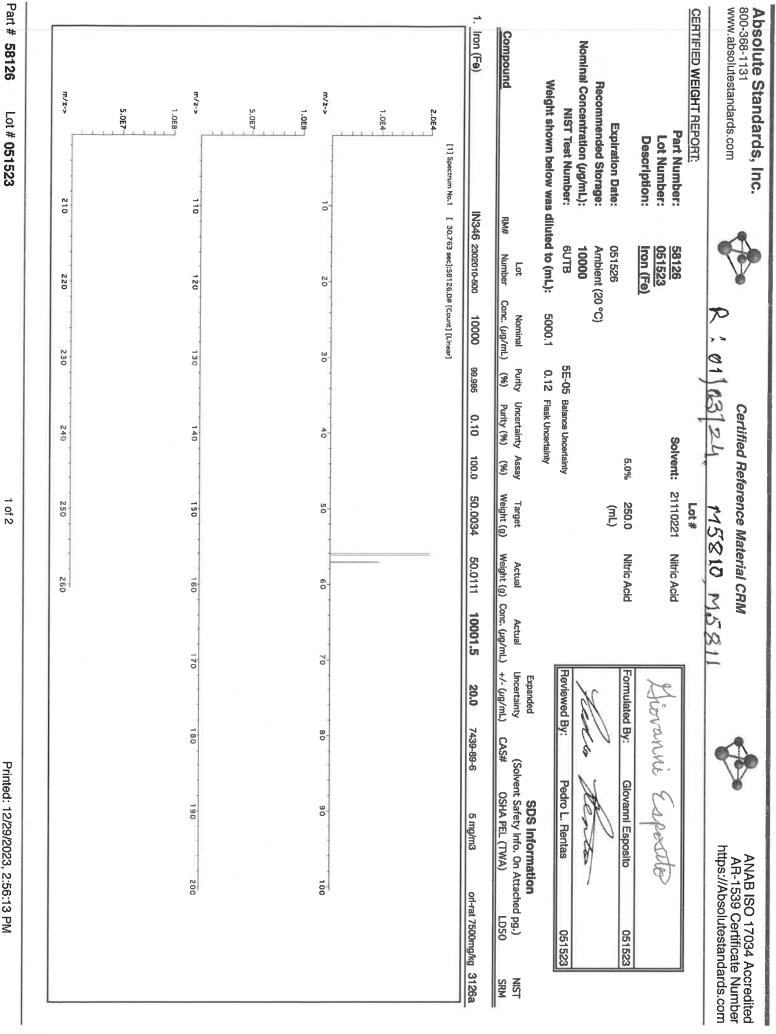
Certified by:

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

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

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

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Printed: 12/29/2023, 2:56:13 PM

| 11. 2015 BT 70000 an | 4002       C:       4002       Fe       4 |                      | Trace Metals Verification by ICP-MS (µg/mL) | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):  | Description       Descring <thdescring< th="">       Descring       <thd< th=""><th></th></thd<></thdescring<> |  |
|----------------------|---|----------------------|---|--|--|--|
|                      | (T) = Target analyte  | (T) = Target analyte | (T) = Target analyte                        | Is Verification by ICP-MS (µg/mL)         4002       Ni       40.0       Pi       Mi       Mi       Mi       Mi | etrometry (ICP-MS):<br>Is Verification by ICP-MS ( $\mu$ g/mL)<br>$\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | trified Reference Material CRMCtrometry (ICP-MS):Is Verification by ICP-MS (µg/mL) $4002$ Ni $402$ Ni $402$ $4002$ Ni $402$ Re $402$ $32$ $4002$ Re $402$ $32$ $32$ $402$ $402$ Re $402$ $32$ $32$ $402$ $402$ Re $402$ $32$ $32$ $402$ $402$ Re $402$ $32$ $32$ $402$ $1$ $402$ $32$ $32$ $33$ $402$ $1$ $402$ $32$ $32$ $32$ $32$ $1$ $402$ $32$ $32$ $33$ $402$ $1$ <t< th=""></t<> |

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com      | -   | Certified Reference Material CRM<br>R :  ষ্টি বিশ্ব M6025 | CRM ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com                    |
|--|---|---|---|
| CERTIFIED WEIGHT REPORT:<br>Part Number:                                   | 57182                                     | Lot #<br>Solvent: 24002546 Nitric                         | Acid  |
| Description:   | Lead (Pb)                                 | 2% 40.0 Nitric  | Acid Formulated By: Lawence Barry   |
| Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µq/mL): | 110926<br>Ambient (20 °C)<br><b>10000</b> | (mL)  | Here ten  |
| NIST Test Number:  | 6UTB                                      | 5E-05 Balance Uncertainty                                 | Reviewed By: Pedro L. Rentas  |
| Weight shown below was diluted to (mL):                                    |   | 2000.02 0.058 Flask Uncertainty                           |   |
|  | Lot                                       | Nominal Purity Uncertainty Assay Target Actual            | SDS Information           sal         Actual         Uncertainty         (Solvent Safety Info. On Attached pg.) |
| Compound   | RM# Number Con                            | Purity (%) (%) Weight (g) W                               | (g) Conc. (µg/mL) +/- (µg/mL) CASi  |
| 1. Lead(II) nitrate (Pb)   | IN029 PBD122016A1                         | 10000 93.999 0.10 62.5 32.0006 32.0040                    | 040 10001.1 20.0 10099-74-8 0.05 mg/m3  |
| [1] Spectrum No.1<br>1.0E7   | -   | 17.284 sec]:58182.D# [Count] [Linear]                     |   |
| ຽ.<br>ດ<br>ຄ   |   |   |   |
| m/z-> 10   | 2<br>0                                    | 30<br>40<br>50  | 0 70 80 90  |
|  |   |   |   |
| 1.006  |   |   |   |
| m/z-> 110  | 120                                       | 130 140 150 16  | 160 170 180 190   |
|  |   |   |   |
|  |   |   |   |
|  | h   | A30 K40 K50 N   | 260   |
| Part # 57182 Lot # 110923  |   | 1 of 2  | Printed: 8/1/2024, 2:13:36 PM   |

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

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

|    |               |        | and the second second |     |       |    | TI acci ilio | Cais | VCITICA |    |       | O I | HALLIN' |    |               |    |       |    |          |
|----|---------------|--------|-----------------------|-----|-------|----|--------------|------|---------|----|-------|-----|---------|----|---------------|----|-------|----|----------|
| AI | Am            | 3      | AB                    | 7   | 3     | цг | 33           | :    | 3       | NE | 2     |     | 200     | 2  |               |    |       |    |          |
| 3  |               | 1      |                       | 1   |       |    |              | ţ    | 10.02   | 3  | 10.02 | 1.1 | 20.02   | ő  | 70>           | 01 | 20.02 | ¥  | <0.02    |
| S  | <b>4</b> 0.02 | ß      | <0.2                  | ц,  | <0.02 | Но | 40.02        | E    | <0.02   | Å  | <0.02 | Re  | <0.02   | Si | A0.02         | P  | <0.02 | 9  | 40.02    |
| As | <b>4</b> 0.2  | ĉ      | <0.02                 | E   | <0.02 | 6  | <0.02        | Mg   | <0.01   | õ  | <0.02 | R   | <0.02   | Ag | 40.02         | H  | 40.02 | <  | 20.02    |
| Ba | A0.02         | S      | 40.02                 | ନ୍ଥ | <0.02 | 7  | 40.02        | 5    | 30      | ¥  | 3     | Ŗ   | 3       | ξ, | 5             | 7  | 5     | \$ |          |
| 5  | 2             | 2      |                       | 2   |       |    |              |      |         | 1  |       |     |         |    | 10.00         |    | 70.02 | 77 | 10.02    |
| Ве | 10.05         | ۵<br>۵ | <0.02                 | Ga  | <0.02 | F  | 40,2         | ЯH   | 40.2    | ٩  | <0.02 | Ru  | <0.02   | ş  | <b>⊲</b> 0.02 | F  | <0.02 | ~  | A0.02    |
| B  | A0.02         | S      | <0.02                 | ନ୍ନ | <0.02 | 5  | <0.02        | Mo   | <0.02   | 7  | <0.02 | Sm  | <0.02   | 60 | 40.02         | 5  | <0.02 | Zn | Ang<br>N |
| ₿  | <0.02         | Q      | <b>4</b> 0.02         | Au  | <0.02 | \$ | т            | M    | <0.02   | ĸ  | <0.2  | Sc  | <0.02   | Ţ  | 40,02         | 3  | 40.02 | 2  | 20.02    |

# **Physical Characterization:**

(T)= Target analyte

Certified by:

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

Son P. Shirt

\* 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).

| Weight shown below was diluted to (mL): 2000.02 0.058 Flax Uncertainty Asay           Compound         Intel (Pb)         IN029 Resizented         Conc. (ug/mL)         Puity (N0)         Puity (N0) | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com<br>CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Description:<br>Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL);<br>NIST Test Number: |
|--|---|
| IN029         PBD/IZ01641         10000         99.999           10         20         30         30         30           30         110         120         30         30           210         120         130         130         130   | NIST Test Number:<br>Weight shown below wa  |
| EG 10 20 30 40<br>EG 130 140<br>EG 20 220 230 240  | N   |
| E6 10 20 30 40   | 5.OE6   |
| E E E E E E E E E E E E E E E E E E E  |   |
| E E E E E E E E E E E E E E E E E E E  | 1.000   |
| 270<br>220<br>230<br>240   |   |
| 210 220 230 240  | 5.<br>OE5   |

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Lot # 110923

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

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

|    |               |        | and the second second |     |       |    | TI acci ilio | Cais | VCITICA |    |       | C IA | HALLIN' |    |               |     |       |    |          |
|----|---------------|--------|-----------------------|-----|-------|----|--------------|------|---------|----|-------|------|---------|----|---------------|-----|-------|----|----------|
| AI | Am            | 3      | AB                    | 7   | 3     | цг | 33           | :    | 3       | NE | 2     |      | 200     | 2  |               |     |       |    |          |
| 3  |               | 1      |                       | 1   |       |    |              | ţ    | 10.02   | 3  | 10.02 | 1.1  | 20.02   | ő  | 70>           | 01  | 20.02 | ¥  | <0.02    |
| S  | <b>4</b> 0.02 | ß      | <0.2                  | ц,  | <0.02 | Но | 40.02        | E    | <0.02   | Å  | <0.02 | Re   | <0.02   | Si | A0.02         | P   | <0.02 | 9  | 40.02    |
| As | <b>4</b> 0.2  | ĉ      | <0.02                 | E   | <0.02 | 6  | <0.02        | Mg   | <0.01   | õ  | <0.02 | R    | <0.02   | Ag | 40.02         | H   | 40.02 | <  | 20.02    |
| Ba | 40.02         | S      | 40.02                 | ନ୍ଥ | <0.02 | 7  | 40.02        | 5    | 30      | ¥  | 3     | Ŗ    | 3       | ξ, | 5             | 7   | 5     | \$ |          |
| 5  | 2             | 2      |                       | 2   |       |    |              |      |         | 1  |       |      |         |    | 10.00         | *** | 70.02 | 77 | 10.02    |
| Ве | 10.05         | ۵<br>۵ | <0.02                 | Ga  | <0.02 | F  | 40,2         | ЯH   | 40.2    | ٩  | <0.02 | Ru   | <0.02   | ş  | <b>⊲</b> 0.02 | F   | <0.02 | ~  | A0.02    |
| B  | A0.02         | S      | <0.02                 | ନ୍ନ | <0.02 | 5  | <0.02        | Mo   | <0.02   | 7  | <0.02 | Sm   | <0.02   | 60 | 40.02         | 5   | <0.02 | Zn | Ang<br>N |
| ₿  | <0.02         | Q      | <b>40.02</b>          | Au  | <0.02 | \$ | т            | M    | <0.02   | ĸ  | <0.2  | Sc   | <0.02   | Ţ  | 40,02         | 3   | 40.02 | 2  | 20.02    |

# **Physical Characterization:**

(T)= Target analyte

Certified by:

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

Son P. Shirt

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

- the preparation of all standards.
- \* All standard containers are meticulously cleaned prior to use.
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- \* 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).

M4371

Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent Suitable for Mercury Determination (hydroxylammonium chloride)

Rec - 06.07.12



avantor

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,

| Test   | Specification | Result  |
|--|---------------|---------|
| ssay (NH₂OH · HCl) (by KMnO₄ titrn)          | >= 96.0 %     | 99.1    |
| larity of Alcohol Solution                   | Passes Test   | PT      |
| esidue after Ignition                        | <= 0.050 %    | 0.017   |
| itrable Free Acid (meq/g)                    | <= 0.25       | 0.19    |
| mmonium (NH4)                                | Passes Test   | РТ      |
| ulfur Compounds (as SO4)                     | <= 0.005 %    | < 0.003 |
| race Impurities – ACS – Heavy Metals (as Pb) | <= 5 ppm      | 4       |
| race Impurities – Iron (Fe)                  | <= 5 ppm      | < 3     |
| race Impurities – Mercury (Hg)               | <= 0.050 ppm  | < 0.005 |

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 Techie

Jamie Ethier 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 Certificate of Analysis **ThermoFisher** S C I E N T I F I C

M4913-16

Page 1 of 1

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 Buston

Julian Burton - Quality Control Manager - Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701. \*Based on suggested storage condition. Certificate of Analysis **ThermoFisher** S C I E N T I F I C

MY917-20

### Certificate of Analysis

MB

| 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 |
| 201.796.1329 fax    | Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632                            |

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| Catalog Number    | T142                 | Quality Test / Release Date   | 03/22/2021            |
|-------------------|----------------------|---|-----------------------|
| Lot Number        | 210800               |   |                       |
| Description       | STANNOUS CHLORIDE, D | IHYDRATE CERTIFIED ACS (Suitable for Me   | ercury Determination) |
| Country of Origin | United States        | Suggested Retest Date   | Mar/2026              |
| Chemical Origin   | Inorganic-non animal |   |                       |
| BSE/TSE Comment   |                      | d as starting raw material ingredients, or used<br>or material that might migrate to the finished p |                       |

| N/A               |           |                            |                     |  |  |  |  |  |
|-------------------|-----------|----------------------------|---------------------|--|--|--|--|--|
| Result Name       | Units     | Specifications             | Test Value          |  |  |  |  |  |
| APPEARANCE        |           | REPORT                     | Clear crystals      |  |  |  |  |  |
| ASSAY             | %         | Inclusive Between 98 - 103 | 101.56              |  |  |  |  |  |
| CALCIUM           | %         | <= 0.005                   | <0.005              |  |  |  |  |  |
| IDENTIFICATION    | PASS/FAIL | = PASS TEST                | PASS TEST           |  |  |  |  |  |
| IRON (Fe)         | %         | <= 0.003                   | <0.003              |  |  |  |  |  |
| LEAD (Pb)         | %         | <= 0.01                    | <0.01               |  |  |  |  |  |
| MERCURY (Hg)      | ppm       | <= 0.05                    | <0.05               |  |  |  |  |  |
| POTASSIUM (K)     | %         | <= 0.005                   | <0.005              |  |  |  |  |  |
| 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%) |  |  |  |  |  |

Julian Buston

Julian Burton - Quality Control Manager - Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701.

\*Based on suggested storage condition.



# 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:<br>Mercury           |
| Starting Material:        | Hg metal                          |
| Starting Material Lot#:   | 1959                              |
| Starting Material Purity: | 99.9994%                          |
| CERTIFIED VALUES          | AND UNCERTAINTIES                 |

| Certified Value: | 10.001 ± 0.053 μg/mL                   |
|------------------|--|
| Density:         | 1.020 g/mL (measured at 20 $\pm$ 4 °C) |

### Assay Information:

3.0

| ANALYTE | METHOD     | NIST SRM# | SRM LOT#     |
|---------|------------|-----------|--------------|
| Hg      | ICP Assay  | 3133      | 160921       |
| Hg      | EDTA       | 928       | 928          |
| Hg      | Calculated |           | See Sec. 4.2 |

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

| 0 | Ag |   | 0.000011 | M | Eu | < | 0.000201 | 0 | Na |   | 0.000004 | М | Se | < | 0.015915 | 0 | Zn | < | 0.001510 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| 0 | AI |   | 0.000001 | 0 | Fe |   | 0.000001 | М | Nb | < | 0.000201 | 0 | Si |   | 0.000005 | М | Zr | < | 0.000201 |
| М | As | < | 0.000402 | Μ | Ga | < | 0.000201 | Μ | Nd | < | 0.000201 | М | Sm | < | 0.000201 |   |    |   |          |
| М | Au | < | 0.003631 | М | Gd | < | 0.000201 | M | Ni | < | 0.000402 | M | Sn | < | 0.001007 |   |    |   |          |
| Μ | В  | < | 0.001208 | М | Ge | < | 0.000201 | М | Os | < | 0.000605 | М | Sr | < | 0.000201 |   |    |   |          |
| Μ | Ba | < | 0.000201 | Μ | Hf | < | 0.000201 | 0 | Ρ  | < | 0.032370 | M | Та | < | 0.000201 |   |    |   |          |
| Μ | Be | < | 0.000201 | s | Hg | < |          | Μ | Pb | < | 0.000201 | M | Tb | < | 0.000201 |   |    |   |          |
| Μ | Bi | < | 0.000201 | М | Ho | < | 0.000201 | Μ | Pd | < | 0.000403 | М | Te | < | 0.002216 |   |    |   |          |
| 0 | Ca |   | 0.000007 | Μ | In | < | 0.000201 | Μ | Pr | < | 0.000201 | М | Th | < | 0.000201 |   |    |   |          |
| M | Cd | < | 0.000201 | М | lr | < | 0.000201 | М | Pt | < | 0.000402 | M | Ti | < | 0.000402 |   |    |   |          |
| Μ | Ce | < | 0.000201 | 0 | Κ  |   | 0.000020 | М | Rb | < | 0.000201 | 0 | ΤI | < | 0.016508 |   |    |   |          |
| M | Co | < | 0.000201 | М | La | < | 0.000201 | Μ | Re | < | 0.000201 | Μ | Tm | < | 0.000201 |   |    |   |          |
| 0 | Cr | < | 0.003021 | 0 | Li | < | 0.000107 | М | Rh | < | 0.000201 | М | U  | < | 0.008058 |   |    |   |          |
| М | Cs | < | 0.001208 | М | Lu | < | 0.000201 | Μ | Ru | < | 0.000201 | Μ | V  | < | 0.000201 |   |    |   |          |
| М | Cu | < | 0.000402 | 0 | Mg |   | 0.000001 | 0 | S  | < | 0.053950 | М | W  | < | 0.000604 |   |    |   |          |
| M | Dy | < | 0.000201 | M | Mn | < | 0.000604 | М | Sb | < | 0.001208 | М | Y  | < | 0.000201 |   |    |   |          |
| Μ | Er | < | 0.000201 | М | Мо |   | 0.000009 | М | Sc | < | 0.000201 | М | 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 guestions 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

Ulya new

### **Certificate Approved By:**

Michael Booth Director, Quality Control

Michael 2 Booth

### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director

Paul R Laine



## **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

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### 2.0 PRODUCT DESCRIPTION

| Multi Analyte Custom Grade Solution  | on   |
|--|--|
| 6020CAL-1  |  |
| S2-MEB711244   |  |
| 5% (v/v) HNO3<br>tr. HF  |  |
| 20 µg/mL ea:<br>Silver,<br>Arsenic,<br>Beryllium,<br>Cadmium,<br>Chromium,<br>Iron,<br>Magnesium,<br>Sodium,<br>Lead,<br>Selenium, | Aluminum,<br>Barium,<br>Calcium,<br>Cobalt,<br>Copper,<br>Potassium,<br>Manganese,<br>Nickel,<br>Antimony,<br>Thallium,  |
| Vanadium,  | Zinc   |
|  | 6020CAL-1<br>S2-MEB711244<br>5% (v/v) HNO3<br>tr. HF<br>20 µg/mL ea:<br>Silver,<br>Arsenic,<br>Beryllium,<br>Cadmium,<br>Chromium,<br>Iron,<br>Magnesium,<br>Sodium,<br>Lead,<br>Selenium, |

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

Density:

| Density:         | 1.026 g/mL (measi | ared at $20 \pm 4$ °C) |              |
|------------------|-------------------|------------------------|--------------|
| Assay Informatio | n:                |                        |              |
| ANALYTE          | METHOD            | NIST SRM#              | SRM LOT#     |
| Ag               | ICP Assay         | 3151                   | 160729       |
| Ag               | Volhard           | 999c                   | 999c         |
| AI               | ICP Assay         | 3101a                  | 140903       |
| AI               | EDTA              | 928                    | 928          |
| As               | ICP Assay         | 3103a                  | 100818       |
| Ва               | ICP Assay         | 3104a                  | 140909       |
| Ва               | Gravimetric       |                        | See Sec. 4.2 |
| Be               | ICP Assay         | 3105a                  | 090514       |
| Са               | ICP Assay         | 3109a                  | 130213       |
| Са               | EDTA              | 928                    | 928          |
| Cd               | ICP Assay         | 3108                   | 130116       |
| Cd               | EDTA              | 928                    | 928          |
| Co               | ICP Assay         | 3113                   | 190630       |
| Co               | EDTA              | 928                    | 928          |
| Cr               | ICP Assay         | 3112a                  | 170630       |
| Cu               | ICP Assay         | 3114                   | 121207       |
| Cu               | EDTA              | 928                    | 928          |
| Fe               | ICP Assay         | 3126a                  | 140812       |
| Fe               | EDTA              | 928                    | 928          |
| Fe               | Calculated        |                        | See Sec. 4.2 |
| К                | ICP Assay         | 3141a                  | 140813       |
| К                | Gravimetric       |                        | See Sec. 4.2 |
| Mg               | ICP Assay         | 3131a                  | 140110       |
| Mg               | EDTA              | 928                    | 928          |
| Mn               | ICP Assay         | 3132                   | 050429       |
| Mn               | EDTA              | 928                    | 928          |
| Na               | ICP Assay         | 3152a                  | 120715       |
| Na               | Gravimetric       |                        | See Sec. 4.2 |
| Ni               | ICP Assay         | 3136                   | 120619       |
| Ni               | EDTA              | 928                    | 928          |
| Pb               | ICP Assay         | 3128                   | 101026       |
| Pb               | EDTA              | 928                    | 928          |
| Se               | ICP Assay         | 3149                   | 100901       |
| Se               | Calculated        |                        | See Sec. 4.2 |
| TI               | ICP Assay         | 3158                   | 151215       |
| ТІ               | Calculated        |                        | See Sec. 4.2 |
| V                | ICP Assay         | 3165                   | 160906       |
| V                | EDTA              | 928                    | 928          |
| Zn               | ICP Assay         | 3168a                  | 120629       |
| Zn               | EDTA              | 928                    | 928          |
|                  |                   |                        |              |

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

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

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### 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

4.0

### 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°  $\pm$  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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### **11.1 Certification Issue Date**

October 20, 2021

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

### 11.2 Lot Expiration Date

### - October 20, 2026

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

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

### 11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

### Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line

| m/z->       | 5<br>0<br>0<br>0 | m/z-><br>1.0⋿4 | 1.065 | m/z-><br>2.065 | 1.000 | N.OE                                  | 1. Potassium nitrate (K) | Compound   | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below wa                              | CERTIFIED WEIGHT REPORT:<br>Part I<br>Lot I<br>Des  | 800-368-1131<br>www.absolutestandards.com  |
|-------------|------------------|----------------|-------|----------------|-------|---------------------------------------|--------------------------|--|---|---|--|
| 210 220     |                  | 110 120        |       | 10             |       | [1] Spectrum No.1 [                   | IN034 KD022021A1         | RM# Number   | Expiration Date:120825Recommended Storage:Ambient (20 °C)Il Concentration (µg/mL):10000NIST Test Number:6UTBWeight shown below was diluted to (mL):30 | <u>PORT:</u><br>Part Number: <u>58119</u><br>Lot Number: <u>120822</u><br>Description: <u>Potassium (K)</u> | om   |
| 230         |                  | 130            |       | ۵<br>O         |       |                                       | 10000 . 9                | Nominal P<br>Conc. (µg/mL)   | 20 °C)<br>3000.4  | am (K)  |  |
| 240         |                  | 140            |       | 4.<br>0.       |       | 35.763 sec]:58119.D# [Count] [Linear] | 99.999 0.10 37.6         | Purity Uncertainty Assay<br>(%) Purity (%) (%)                                     | 29<br>5E-05 Balance Uncertainty<br>0.06 Flask Uncertainty   | Solvent:  | Certified R  |
| N<br>U<br>U |                  | 150            |       | ທ.<br>ດັ       |       | čount] [Line                          | .6 79.7990               | ay Target<br>5) Weight (g)   | 2% 60.0<br>(mL)   | Lot #<br>nt: 20510011   | Certified Reference Material CRM   |
| N<br>20     |                  | 160            |       | 0              |       | er)                                   |                          | Actual /<br>Weight (g) Conc  | Nitric Acid   | Nitric Acid   | terial CRM   |
|             |                  | 170            |       | 70             |       |                                       | 10001.1 20.0             | Expanded<br>Actual Uncertainty<br>Conc. (µg/mL) +/- (µg/mL)                        | Revie   | re  | R R: 0   |
|             |                  | 180            |       | 8<br>O         |       |                                       | .0 7757-79-1             | CAS  | Formulated By:  | tovanni   | RINA   |
|             |                  | 190            |       | 8<br>0         |       |                                       | 5 mg/m3                  | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD5( | Giovanni Esposito   | Especito  | at v   |
|             |                  | 200            |       | 10.00          |       | ·                                     | orl-rat 3015 mg/kg       | <b>mation</b><br>On Attached pg.)<br>(A) LD50                                      | 120822  | Ğ   | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|             |                  |                |       |                |       |                                       | lei I                    | NIST   |   |   | 4 Accredite<br>cate Numb<br>andards.co   |

Part # 58119 Lot # 120822

1 of 2

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|  | Printed: 3/16/2023, 1:45:22 PM   | Printed: 3 |  |                     |   |                              |   | 2 of 2   |  |  |   |   |  |  | 0822   | Lot # 120822   |  | Part # 58119                               | Par |
|--|--|------------|--|---------------------|---|------------------------------|---|--|--|--|---|---|--|--|--|--|--|--|-----|
|  |  |            |  | above)<br>of NIS    | to NIST (see above).<br>9 Uncertainty of NIST<br>9.C. (1994). | le to N<br>the Ur<br>1, D.C. | Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | weight<br>d.<br>ry cond<br>i and E:<br>fice, W | ated with<br>ise state<br>laborator<br>valuating<br>rinting Of | e calibr:<br>otherw<br>opriate<br>es for E<br>ment P | Standards are prepared gravimetrically using balances that are calibrated with weights trace<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressi<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washing | balance<br>ed valu<br>t and u<br>it, C.E.,<br>297, U. | Insignation of the standard for the stan | metrica<br>0.5% of<br>d with (<br>r, B.N.<br>echnica | Standards are prepared gravimetrically using balances that ar<br>Standards are certifed (+/-) 0.5% of the stated value, unless<br>All standards should be stored with caps tight and under app<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin<br>Measurement Result," NIST Technical Note 1297, U.S. Govern   | e prepa<br>e certifi<br>should<br>leferend<br>t Result | idards an<br>Idards an<br>Idards an<br>Itandards<br>ertainty F<br>Isuremen   | * Star<br>* All s<br>Mea                   |     |
|  |  |            | tated.<br>sed in                               | rwise s<br>Is are u | s unless otherwise stated.<br>raw materials are used in       | ents ur<br>rity rav          | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohim deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.   | the hi   | ind volum<br>sware and   | netric a<br>A glas:                                  | om gravir<br>Ited Class   | lated fr<br>, calibra                                 | ion calcu<br>ed water  | centrat<br>deioniz<br>ds.                            | The certified value is the concert<br>Purified acids, 18.2 megohim deic<br>the preparation of all standards.<br>All the preparation of all standards.  | value is<br>18.2 I<br>ion of a                         | certified<br>fied acids<br>preparat  | * The<br>* Puri-                           |     |
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|  | in P. M.   | 1          |  |                     |   |                              |   |  |  | ndard.   | Homogeneity: No heterogeneity was observed in the preparation of this standard.   | paration  | d in the pr  | observe  | eneity was   | heterog  | geneity: No  | Homo                                       |     |
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|  |  |            |  |                     | , B   |                              | ulyte   | (T) = Target analyte                           | (T) = Ta   |  |   |   |  |  | œ  |  |  |  |     |
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| Al<br>Sb<br>Ba<br>Be<br>Bi<br>Bi           |     |
|  |  |            |  | []                  | (µg/mL)   | S                            | Verification by ICP-M   | ation  |  | Metals   | Trace M   |   |  |  |  |  |  |  |     |
|  |  |            |  |                     |   |                              | <b>(S):</b>   | ICP-M  | ometry (   | Spectr   | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):   | ed Plas   | y Couple   | uctive   | is by Ind  | Analys   | umental  | Instr                                      |     |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | ANAB IS<br>AR-1539<br>https://Abs  | V          |  |                     |   | CRM                          | Certified Reference Material CRM  | rence  | fied Refe  | Certi  |   |   | V  |  | , inc.   | dards.con  | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com  | Absolute :<br>800-368-1131<br>www.absolute |     |

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| m/z->   | N.5<br>6 | m/z-≯<br>5.0E5  | ភ.<br>០<br>ពេស | m/z-><br>1.0≣6 | 5000 | 1.0트4                                 | 1. Chromium(III) nitrate nonahydrate (Cr) | Compound  | Volume sho                              | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (ug/mL): | Par<br>De                                   | CERTIFIED WEIGHT REPORT: | www.absolutestandards.com                                   |
|---------|----------|---|----------------|----------------|------|---------------------------------------|---|---|---|--|---|--------------------------|---|
| N<br>10 |          | 110   |                | <b>1</b>       |      | [1] Spectrum No.1                     |   | Pa  | Volume shown below was diluted to (mL): | Expiration Date:<br>nended Storage:<br>ntration (µg/mL):                   | Part Number:<br>Lot Number:<br>Description: | 0                        | 3   |
| 220     |          | 120   |                | N.<br>O        |      | -                                     | 58124 071122                              | Part Lot<br>Number Number                                     | filuted to (mL):                        | 060526<br>Ambient (20 °C)<br>1000  | <u>58024</u><br>060523<br>Chromium (Cr)     |                          | A   |
| 230     |          | 130   |                | ů.<br>O        |      | 31,393 80                             | 0.1000                                    | Dilution<br>Factor  | 2000.02                                 |  | 1 (Cr)                                      |                          | MS  |
| 240     |          | 140   |                |                |      | c]:57024.                             | 200.0 0.084                               | Initial Uncertainty<br>Vol. (mL) Pipette (mL)                 | 0.058 Flask U                           |  |   |                          | MS658   |
|         |          |   |                | ð.             |      | 31,393 sec]:57024.D# [Count] [Línear] | 084 1000                                  | Uncertainty Nominal<br>Pipetta (mL) Conc. (µg/mL)             | Flask Uncertainty                       |  | 21110221<br>2.0%                            | Lot #                    | ) A   |
| N<br>50 |          | 」<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>() |                | S              |      | t] [Linear]                           | 10 10000.1                                | nał Initial<br>g/mL) Conc. (µg/mL)                            |   | (mL)   | 221 Nitric Acid<br>% 40.0                   | # Solvent:               |   |
| 200     |          | 160   |                | 0              |      | ş                                     | 0.1 <b>1000.0</b>                         | al Final<br>rg/mL) Conc. (µg/mL)                              |   | Ľ  | Acid<br>.0 Nitric Acid                      | ent:                     | 123   |
|         |          | 170   |                | 70             |      |                                       | 0.0 2.2                                   | Expanded<br>al Uncertainty<br>ig/mL) +/- (µg/mL)              | Lineviewed by.                          | X  | Acid Formulated By:                         |                          | 1   |
|         |          | 180   |                | 8-<br>0-       |      | 1                                     | 7789-02-8                                 | ) CAS   |   | a la   | Horner                                      |                          |   |
|         |          | 190   |                | Ŷ              |      |                                       |   | jolvent<br>Os   |   | ten  | Lawrence Barry                              |                          | Y   |
|         |          | 20-<br>00-  |                | 100            |      |                                       | 0.5 mg(Cr)/m3 ort-                        | SDS Information<br>nt Safety Info. On Attac<br>OSHA PEL (TWA) |   | Ø  | nce Barry                                   |                          | AH-15:<br>https://Ab  |
|         |          | 0   |                | o              |      |                                       | ort-rat 3250 mg/kg                        | ched pg.)<br>LDS0   | 00000                                   | 00050  | 060523                                      |                          | AH-1539 Certificate Number<br>https://Absolutestandards.com |
|         |          |   |                |                |      |                                       | g 3112a                                   | NIST  |   | ٥ <u> </u>   | [ω]   | 1                        | te Numbe<br>dards.com                                       |

Part # 58024 Lot # 060523

1 of 2

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| Absolute Standards, Inc.       Certified Reference         800-368-1131       Image: Certified Reference         www.absolutestandards.com       Image: Certified Reference         Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):  | andards.cor   | s by Indu  | ictive   | y Coupled   | Plasn   | na Mass S   | Spectr C   | Certified Reference Material Ci   | ICP-M   | IS):  | ateria  | I CRM  |   |                                     |                |        | ¥          | 크             | ANAB<br>AR-11<br>ttps:/// | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | 034 Acc<br>lificate N<br>standar | lumbe<br>ds.corr |
|--|---|--|--|---|---|---|--|---|---|---|---|--|---|-------------------------------------|----------------|--------|------------|---------------|---------------------------|--|----------------------------------|------------------|
| the stype of the style   |   |  |  |   |   | Trace N   | Metals   | s Verification  | ation   | হ   | ICP-MS  |  | /g/mL)  |                                     |                |        |            |               |                           |  |                                  |                  |
| AI <0.02   |   | 40,02  | Dv   | 40.02   | H   | <0.02   | E  | 40.02   | -<br>N  | -<br>-  | 20  |  | A) 02   | 8                                   | a)             | -      | -          |               |                           | 3  |                                  |                  |
|  |   | 40.02  | Er Dy  | <0.02   | Ho  | <0.02   | 달드   | 4)02<br>4)02  | N N   | A0.02   | 88  | <u>ም</u> ፡   | 40.02<br>0.02   | <u>8</u> %                          | 40.02<br>00.02 | ਜ ਸ    | <b>4 4</b> | c ¥           |                           | <0.02  |                                  |                  |
|  | _   | <0.02  | 말  | <0.02   | 5   | <0.02   | Mg   | <0.01   | <sup>2</sup> 0                                | <0.02   | .02   | Rh   | 40.02   | Ag                                  | <0.02          | 1      | <0.02      |               |                           | <0.02  |                                  |                  |
| Ba 40.02   | ନ<br>ଜ  | -T -T  | ନ୍ଦ୍ର ହ  | A 0.02  | ₹ <sup>1</sup> =="  | 4. 6. B   | H. Ma  | A. A.   | P P   | A A 3 3   | 38  | 장  | A A<br>3<br>3   | ç N                                 | A A 1          | 13     | A.2        | 4 15          |                           | 0.02<br>0  |                                  |                  |
|  |   | 40.02  | 2 ଜ ା  | 40.02   | 323   | 4 4 A   | N M ;  | 8 8 8   | × 77 ·  | A 40 12   | រ ន រ   | Sc Sm  | 40.02<br>2002   | Ta s                                | 4 4 A A        | 11 S 🔒 |            |               |                           |  |                                  |                  |
|  |   |  |  |   |   |   |  | (T)=  | (T)= Target analyte                           | anatyte   |   |  |   |                                     |                |        |            |               |                           |  |                                  |                  |
| Physical Characterization:   | aracteriz   | ation:   |  |   |   |   |  |   |   |   |   |  |   |                                     |                |        | C          | Certified by: | by:                       |  | a                                |                  |
| Homogeneity: No heterogeneity was observed in the preparation of this standard.  | No heteroge   | meity was o  | observe  | d in the preps  | aration (   | of this stand   | lard.  |   |   |   |   |  |   |                                     |                |        | 1          | 14            | 1                         |  | ľ                                |                  |
| <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>* 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.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* 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).</li> </ul> | ad value is<br>ds, 18.2 n<br>ation of all<br>are prepar<br>are prepar<br>are certife<br>ds should<br>ds should<br>ent Result. | he conc<br>megohm d<br>Ill standarc<br>are me<br>ars are me<br>are are are me<br>ars are me<br>ars are me<br>ars are me<br>ars are me<br>ars are me<br>are are are me<br>are are are me<br>are are are are are<br>are are are are are are<br>are are are are are are are<br>are are are are are are are are are are<br>are are are are are are are are are are | entrat<br>leioniz<br>ls.<br>sticulou<br>etrica<br>.5% of<br>.5% of<br>.5 | ed water, c<br>ed water, c<br>usly cleane<br>ully using ba<br>f the state<br>f the state<br>f the state<br>and Kuyat,<br>a Note 122 | ted fro<br>calibrat<br>d prior<br>alanced<br>d value<br>and un<br>and un<br>97, U.S | red Class,<br>ted Class,<br>that are<br>that are<br>that are<br>der appro<br>Guideline<br>Guideline | A glass<br>A glass<br>calibra<br>priate<br>s for E<br>nent P | nd volume<br>sware and<br>ited with<br>ites stated<br>laborator,<br>ivaluating<br>vinting Off | the hi<br>weight<br>cond<br>y cond<br>fice, W | ighest p<br>ighest p<br>is trace<br>itions.<br>xpressir<br>/ashingt | ments<br>ourity<br>able tr<br>able the<br>ton, D. | unless<br>raw m<br>raw m<br>NIST<br>0 NIST<br>0.<br>C. (19 | materials are used in<br>Materials are used in<br>ST (see above).<br>ertainty of NIST<br>1994). | se stat<br>re usec<br>vve).<br>NIST | n .            |        |            |               |                           |  |                                  |                  |
|  |   |  |  |   |   |   |  |   |   |   |   |  |   |                                     |                |        |            |               |                           |  |                                  |                  |
|  |   |  |  |   |   |   |  |   |   |   |   |  |   |                                     |                |        |            |               |                           |  |                                  |                  |

Part # 58024 Lot # 060523

| Part #                         |            |       |                |       |                 |                                  |                                       |                                    |  |   | LEF  |  |
|--------------------------------|------------|-------|----------------|-------|-----------------|----------------------------------|---------------------------------------|------------------------------------|--|---|--|--|
| 58029                          | m/z->      | 1.0巨7 | m/≥-><br>2.0E7 | 2.567 | m/z->-<br>5.0巨7 | 01<br>.0<br>.0<br>.0<br>.0<br>.0 | 1.0E6                                 | Copper(II) nitrate trihydrate (Cu) | Volume sh  | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number: | <u>CERTIFIED WEIGHT REPORT</u><br>Par<br>Lo<br>De  | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
| Lot # 071723                   | 0<br>0     |       | 110            |       | 10              |                                  | [1] Spectrum No.                      |                                    | Volume shown below was diluted to (mL):<br>Part Lot<br>Number Number               | Expiration Date:<br>Recommended Storage:<br>I Concentration (µg/mL):<br>NIST Test Number:       | <u>Part Number:</u><br>Lot Number:<br>Description: | om   |
|                                |            |       | 0              |       |                 |                                  | , J                                   | 58129                              | Part<br>Number   |   |  |  |
|                                | NNO        |       | 120            |       | 20              |                                  | -                                     | 022723                             | d to (mL):<br>Lot<br>Number  | 071726<br>Ambient (20 °C)<br><b>1000</b><br>6UTB  | 58029<br>071723<br>Copper (Cu)                     | 100  |
|                                | 230        |       | 130            |       | а<br>О          |                                  | 53.422 B                              | 0.1000                             | 2000.02<br>Dilution<br>Factor  | °,  | (T   |  |
|                                |            |       | 0              |       | -               |                                  | ac]:58                                | 200.0                              | 0.058<br>Initial<br>Vol. (mL)  | 5E-05   |  |  |
|                                | 840<br>040 |       | <b>4</b><br>0  |       | \$              |                                  | 33.422 sec]:58029.D# [Count] [Linear] | 0.084                              | Flask Uncertainty<br>Uncertainty<br>Pipette (mL) C                                 | Balance Uncertainty   |  | Certified R  |
| 1 of 2                         | N<br>5     |       | 1<br>0         |       | n<br>O          |                                  | Count] [L                             | 1000                               | Flask Uncertainty<br>Uncertainty Nominal<br>Pipette (mL) Conc. (µg/mL)             | L.C. Z  | Lot #<br>21110221                                  | Reference M  |
|                                | N 00       |       | 1.00           |       | Ø               |                                  | lnear]                                | 10000.5                            | Initial<br>Conc. (µg/mL)   | (mL)  | <u> </u>   | laterial   |
|                                | 0          |       |                |       |                 |                                  | _                                     | 1000.0                             | Final<br>) Conc. (µg/mL)   |   |  | CRM<br>M5751   |
|                                |            |       | 0              |       | 70              |                                  |                                       | 2.2                                | Expanded<br>Uncertainty<br>) +/- (µg/mL)   | Reviewed By:  |  |  |
| Prin                           |            |       | 0              |       | g               |                                  |                                       | 10031-43-3                         | CAS  |   |  |  |
| Printed: 8/24/2023, 4:18:28 PM |            |       | 190            |       | 0               |                                  |                                       | 3 1 mg/m3                          | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LDSO | Pedro L. Rentas   |  |  |
| 023, 4:1                       |            |       | N              |       | 4               |                                  |                                       | m3                                 | <b>SDS Information</b><br>Safety Info. On Attac<br>HA PEL (TWA)                    | Rentas  |  | ANAI<br>AR<br>https://   |
| 8:28 PM                        |            |       | 200            |       | 100             |                                  |                                       | orf-rat 794 mg/kg                  | <b>on</b><br>ttached pg.)<br>LDS0  | 071723  | 00743  | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|                                |            |       |                |       |                 |                                  |                                       | (g 3114                            | NIST   | 22  | 5  | Accredited<br>ate Number<br>ndards.com   |

| Printed: 8/24/2023, 4:18:28 PM   | Printed: 8/24/20 |                                       |                           |   |   |  | 2 of 2   |  |  |   |  |  |  | 1723   | Lot # 071723  | 58029  |  | Part # |
|--|------------------|---------------------------------------|---------------------------|---|---|--|--|--|--|---|--|--|--|--|---|--|--|--------|
|  |                  |                                       | stated.<br>used in<br>\$7 | rials are<br>see above<br>inty of NI<br>4). | nless oth<br>w materia<br>NIST (see<br>Incertaint | t purity ra<br>t purity ra<br>ceable to<br>sing the U<br>gton, D.C | highesi<br>highesi<br>ndition:<br>Expres<br>Washin | and the<br>and the<br>with weigi<br>ated.<br>ated.<br>g Office,<br>g Office, | and ve<br>assware<br>vrated v<br>wise st<br>te labo<br>r Evalua<br>Printin | om gravimetric and volumetric measurements unless otherwise stated Class A glassware and the highest purity raw materials are use<br>or to use.<br>It are calibrated with weights traceable to NIST (see above).<br>the, unless otherwise stated.<br>Inder appropriate laboratory conditions.<br>"Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>S. Government Printing Office, Washington, D.C. (1994).   | l from g<br>brated<br>rrior to<br>alue, u<br>alue, u<br>d under<br>E., "Gu<br>U.S. G | <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>* 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.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All Standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* 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).</li> </ul> | onization<br>culoush<br>trically<br>% of th<br>8.N. an<br>hnical N | he concer<br>sgohm dei<br>standards,<br>are meti<br>s are meti<br>d gravime<br>(+/-) 0.5<br>(+/-) 0.5<br>(+/-) 0.5<br>Taylor, I<br>NIST Tecl<br>NIST Tecl  | value is t<br>18.2 m<br>70 n f all m<br>ontainen<br>prepare<br>certifed<br>should b<br>eference<br>Result," | The certified value is the concen<br>Purified acids, 18.2 megohm deio<br>the preparation of all standards.<br>All standard containers are metic<br>Standards are prepared gravimet<br>Standards are certifed (+/-) 0.5<br>Standards should be stored w<br>Uncertainty Reference: Taylor, E<br>Measurement Result," NIST Tech | * * * * * * * * * * * * * * * * * * *      |        |
|  |                  |                                       |                           |   |   |  |  |  |  |   |  |  |  |  |   |  |  |        |
| d by:  | Certified by:    |                                       |                           |   |   |  |  |  |  | is standard.  | ion of th  | Physical Characterization:<br>Homogeneity: No heterogeneity was observed in the preparation of this standard.  | served in  | <b>ion:</b><br>eity was obs  | acterizat<br>heterogen  | Physical Characterization:<br>Homogeneity: No heterogeneity v  | <b>Phys</b> i<br>Homo                      |        |
|  |                  |                                       |                           |   |   | yte  | get anal   | (T) = Target analyte   |  |   |  |  |  |  |   |  |  |        |
| 40.02         W         <0.02           40.02         U         <0.02                    | 다.<br>김 김 그 그 그  | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | Ta S S Na A S S           |   |   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02                 | K P P 2 S N N                                      | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02                           | Hg<br>Nd   | 40.02         Li         40.02         Ni           40.02         Lu         40.02         Ni           40.02         Lu         40.02         Ni           40.02         Mg         40.02         No           40.02         Mg         40.01         Os           40.02         Mg         40.02         Pi           40.02         Hg         40.02         Pi           40.02         Hg         40.02         Pi           40.02         Nd         40.02         Pi           40.02         Nd         40.02         Pi           40.02         Nd         40.02         Pi | 952F5  | 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6  | A C C C F F P  | 40.02<br>- 40. | 5<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2            | 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8  | Al<br>Al<br>Ba<br>Be<br>Bi                 |        |
|  |                  |                                       |                           |   |   | 5  | · .  | ry (ICP-)  | tromet   | Mass Spec   | asma l   | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):  | lively (   | by Induct  | nalysis   | umental A  | Instr                                      |        |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |                  |                                       |                           |   | CRM   | Certified Reference Material CRM                                   | ence   | ed Refer   | Certifi  |   |  |  |  | Inc.   | Standards, Inc.   | Absolute Standards,<br>800-368-1131<br>www.absolutestandards.com   | Absolute :<br>800-368-1131<br>www.absolute |        |

Lot # 071723

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|    |       |   |   |    |       |    | Trace M | letals      | Verification   | Ition  | by ICP-MS   |            | (ng/mL) |    |                              |         |              |    |   | _  |
|----|-------|---|---|----|-------|----|---------|-------------|----------------|--|---|------------|---------|----|------------------------------|---------|--------------|----|---|----|
|    |       | and the second se | A CONTRACTOR OF A CONTRACTOR |    |       |    |         | All and the | TANK ALL STATE | The second s | ALL DESCRIPTION OF THE OWNER OF T | Nonese and |         |    | and the second second second |         |              |    | A COLUMN TO A C | 10 |
| A  | <0.02 | 3   | <0.02   | ñ  | <0.02 | Hf | <0.02   | ГI          | <0.02          | N  | <0.02   | Ł          | <0.02   | Se | <0.2                         | Trb     | <0.02        | M  | <0.02   | -  |
| Sb | <0.02 | J   | 40.2  | 固  | <0.02 | Ho | ≤0.02   | 2           | <0.02          | £  | <0.02   | Re         | <0.02   | S  | <0.02                        | Pe<br>L | <b>40.02</b> | D  | <0.02   | _  |
| As | <02   | ඊ   | <0.02   | Eu | 40.02 | ч  | 40.02   | Mg          | 10.0>          | ő  | <0.02   | Rh         | <0.02   | Ag | <0.02                        | F       | ≤0.02        | >  | <0.02   | -  |
| Ba | <0.02 | ű   | <0.02   | 3  | 40.02 | Ц  | <0.02   | Mn          | <0.02          | P  | ≤0.02   | £          | <0.02   | Ra | <b>40</b> 12                 | đ       | <0.02        | \$ | <0.02   | -  |
| Be | T     | Ċ   | 0.02  | G  | <0.02 | e. | <02     | Hg          | <02            | ۵.   | <0.02   | Ru         | ≤0.02   | 2  | <0.02                        | μ       | <0.02        | 7  | <0.02   | -  |
| Ä  | <0.02 | රී  | <0.0≥   | පී | <0.02 | r. | <0.02   | Mo          | <0.02          | đ,   | <b>0</b> .02  | Sm         | ≤0.02   | s  | <0.02                        | Sn      | <0.02        | Za | <0.02   | -  |
| æ  | <0.02 | ð   | <0.02   | Au | <0.02 | £  | 40.02   | PN          | <0.02          | М  | <0.2  | ŝ          | <0.02   | Ta | <0.02                        | F       | <0.02        | 2  | 40.02   | _  |
|    |       |   |   |    |       |    |         |             | (T) = Tarr     | get analy  | yte   |            |         |    |                              |         |              |    |   | 1  |
|    |       |   |   |    |       |    |         |             |                |  |   |            |         |    |                              |         |              |    |   |    |

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 ( $\frac{1}{4}$ ) 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 # 57050 Lot # | m/z->      | N.01<br>M.4 | m/2->-  | 1.0E5 | 177/2-><br>2.0E5 | N<br>G<br>M<br>G | 8.<br>0<br>11<br>15                   | 1. Ammonium hexatluorostannate(IV) (Sn) | Compound   | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (ug/mL):<br>NIST Test Number:<br>Weight shown below w   | <u>CERTIFIED WEIGHT REPORT</u><br>Part N<br>Lot N<br>Desc  | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|--------------------|------------|-------------|---------|-------|------------------|------------------|---------------------------------------|---|--|---|--|--|
| Lot # 071123       | 210        |             | 110 120 |       | 0<br>No          |                  | [1] Spectrum No.1                     | (W) (Sn) INO10 SND042023A1              | Lot<br>RM# Number  | Expiration Date: 071126<br>Pecommended Storage: Ambient (20 °C)<br>Concentration (µg/mL): 1000<br>NIST Test Number: 6UTB<br>Weight shown below was diluted to (mL): | <u>PORT:</u><br>Part Number: <u>57050</u><br>Lot Number: <u>071123</u><br>Description: <u>Tin (Sn)</u> | s.com  |
|                    | 230        |             | 130     |       | e<br>e           |                  | [ 15.034 sec]:                        | 1000                                    | Nominal<br>Conc. (µg/mL)   | 0 °C)<br>499.93   | 2  | V  |
|                    | 20         |             | 140     |       | ð                |                  | 15.034 sec]:58150.D# [Count] [Linear] | 99.999 0.10 44.2                        | Purity Uncertainty Assay<br>(%) Purity (%) (%)   | 5E-05 Balance Uncertainty<br>0.058 Flask Uncertainty  | Solvents:  | Certifi  |
|                    | N30<br>260 |             | 150 160 |       | 8                |                  | unt) [Linear]                         | 1.13107                                 | r Target Actual<br>Weight (g) Weight (g)   | (mL)  | Lot #<br>21110221<br>22D0562008  | Certified Reference Material   |
|                    |            |             | 170     |       | 70               |                  |                                       | 1001.6                                  | Actual<br>Conc. (µg/mL)  | ric acid  | ric acid   | CRM  |
|                    |            |             | 180     |       | 80               |                  |                                       | 16919-                                  | Expanded<br>Uncertainty (Solv<br>+/- (µg/mL) CAS#  | Formulated By:  |  | PPGP M   |
|                    |            |             | 190 200 |       | 90 100           |                  |                                       | 7 mg/m3                                 | <b>SDS Information</b><br>(Solvent Safety Info. On Attached pg.)<br>)# OSHA PEL (TWA) LD50 | Benson Chan   |  | R  |
|                    |            |             | 0       |       | ŏ                |                  |                                       | ω                                       | on<br>tached pg.) NIST<br>LD50 SRM   | 071123<br>-<br>071123   |  | ANAB ISC<br>AR-1539 (<br>https://Abso  |
|                    |            |             |         |       |                  |                  |                                       |   |  |   |  | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com   | •  | Cei   | Certified Reference Material CRM                    | ial CRM   |                           | ANAB ISO 17034 Accredited                                   |
|---|--|---|---|---|---------------------------|---|
| www.absolutestandards.com   | 5  |   |   |   | <b>V</b>                  | AR-1539 Certificate Number<br>https://Absolutestandards.com |
| Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):   | ductively Coupled  | Plasma Mass Spec  | trometry (ICP-MS):                                  |   |                           |   |
|   |  | Trace Metals  | Is Verification by ICP-MS                           | P-MS (µg/mL)  |                           |   |
| AI <0.02 Cd <0.02   | Dy <0.02   | 4003  |   |   |                           |   |
| A)2<br>C<br>C   |  | 2 2 2<br>2 2 2 2  | 40.02 Ni  |   | Se <0.2 Tb<br>Si <0.02 Te | 40.02 W 40.02   |
| 2 2 2 2<br>2 2 2 2  |  |   | <0.01 Os<br><0.02 Pd                                | Rb<br>Rb  |                           | \$ < c  |
|   | Ge 40.02   | Fe 40.2 Hg  | 40.2 P<br>40.02 Pt                                  | Ru<br>Sm  |                           | _   |
|   |  |   | (T) = Target  | 4   | ZITAS                     | <0.02 Zr <0.02  |
| Physical Characterization:  |  |   |   |   |                           | Certified by:   |
| Homogeneity: No heterogeneity was observed in the preparation of this standard.   | observed in the prepa  | ration of this standard.                                    |   |   |                           | //  |
| ŝ   | 9  |   |   |   |                           | mr P All  |
|   |  |   |   |   |                           |   |
|   |  | 9<br>4  |   |   | 20                        |   |
|   |  |   |   |   | ÷                         |   |
| <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>* 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.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are politoriated with using balances.</li> </ul> | centration calculat<br>deionized water, ca<br>ds.<br>eticulously cleaned | d from gravimetric<br>librated Class A gla<br>prior to use. | and volumetric measurer<br>ssware and the highest p | nents unless otherwise stated.<br>writy raw materials are used in | ie stated.<br>'e used in  |   |

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 # 57050 Lot # 071123

2 of 2

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| redited<br>Jumber<br>ds.com  | NIST<br>SRM  | 3113                                      |   |                                      |
|--|--|---|---|--------------------------------------|
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | Formulated By: Lawrence Barry 091923<br>Formulated By: Lawrence Barry 091923<br>Reviewed By: Pedro L. Rentas 091923<br>Expanded SDS Information<br>Uncertainty (Solvent Safety Info. On Attached pg.) N<br>+/- (ug/mL) CAS# 0SHA PEL (TWA) LD50 S  | ng/kg                                     | 180 B0<br>190 200<br>200 200  | Printed: 2/8/2024, 5:01:14 PM        |
| AM<br>I'U ( fru (  | Nitric Acid  | 1000.0                                    |   |                                      |
| Certified Reference Material CRM $02109124$  | Solvent:<br>Nttric Acid<br>40.0<br>(mL)<br>httal<br>bittal<br>Conc. (ug/mL)  | 10000.0                                   |   |                                      |
| artified Réference l<br>0 2   0 9 1 2 4  | Lot # 24002546<br>24002546<br>2.0%<br>2.0%<br>Nominat<br>Nominat<br>Conc. (rg/mL)  | 1000                                      | 34.243 eec]:58027.D# [Count] [Linear]<br>30 40 50<br>130 140 150<br>230 240 250 | 1 of 2                               |
| Certified F  |  | 0.084                                     | 240<br>240<br>240   |                                      |
| Å  | 5E-05<br>0.058<br>on Initial<br>or Vol. (mL)   | 00 200.0                                  | 3 eec]:55<br>230 30<br>23 130   |                                      |
|  | 57027<br>091923<br>Cobait (Co)<br>091926<br>Ambient (20 °C)<br>1000<br>6UTB<br>6UTB<br>6UTB<br>d to (mL): 2000.02<br>Lot Dilution<br>Lot Dilution  | 23 0.1000                                 |   |                                      |
|  | 57027<br>091923<br>Cobalt (<br>Cobalt (<br>Ambient<br>Ambient<br>1000<br>6UTB<br>ss diluted to (mL<br>Part Lot   | 58127 050923                              |   |                                      |
| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    | CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Description:<br>Cobait (C<br>Cobait (C<br>Cobait (C<br>091926<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>Nominal Concentration (µg/mL):<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>COTB<br>NIST Test Number:<br>COTB<br>CODAIT (C)<br>CODAIT (C)<br>C)<br>CODAIT (C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C)<br>C) | 1. Cobatt(II) nitrate hexahydrate (Co) 58 |   | <pre>Part # 57027 Lot # 091923</pre> |

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

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);

| L | 200   | 10 | 2 Contraction | 4  | 2000          |    | 400         |    |                   | -  |              | 4  |              |    |              |    |       |    |              |
|---|-------|----|---------------|----|---------------|----|-------------|----|-------------------|----|--------------|----|--------------|----|--------------|----|-------|----|--------------|
|   | 20.05 | 3  | 20.05         | 5  | 20.02         | Ħ  | 40.02       | 3  | <0.02             | ż  | 40.02        | £  | 40.02        | 8  | 40.2         | f  | ₫.02  | M  | <b>40.02</b> |
| _ | 40.02 | లి | <b>4</b> 02   | 山  | €0.02         | Ho | 40.02       | 5  | <0.02             | Ż  | <u>40.02</u> | Re | <0.02        | 3  | ≤0.02        | Le | €0.02 | D  | <0.02        |
| _ | 402   | ථ  | €0.05         | 圕  | 40.02         | Ч  | 40'02       | Mg | 10 <sup>0</sup> ⊳ | ő  | ≤0.02        | 붭  | <0.02        | Ag | <b>40.02</b> | F  | <0.02 | Ż  | <0.02        |
| _ | 40.02 | చి | ≤0.02         | ઝ  | <b>600</b>    | ы  | <0.02       | Mn | <0.02             | P  | 40,02        | ßb | <0.02        | Na | 40.2         | đ  | <0.02 | Ŗ  | <0.02        |
| _ | 10.05 | ບັ | ≤0.02         | g  | <b>20.0</b> 2 | ङ  | 402         | Hg | 40.2              | ۵. | €0:02        | Ru | <0.02        | ي. | ≪0.02        | Ta | ≤0.02 | Y  | €0.02        |
| _ | <0.02 | ථ  | £-            | ö  | 40.02         | Ľ  | <b>0</b> 02 | Mo | <u>60.02</u>      | æ, | <0.02        | Sm | <0.02        | S  | <0.02        | Sn | <0.02 | 2  | <b>6</b> .02 |
| _ | 40.02 | ට් | <0.02         | Au | <b>40.02</b>  | £  | 40.02       | PN | 40.02             | м  | <b>4</b> 02  | 8  | <b>40.02</b> | £  | 40.02        | Ë  | 40.02 | 72 | 2002         |

Physical Characterization:

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

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

the preparation of all standards.

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

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

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

Certified by:

| Printed: 2/8/2024, 5:01:04 PM   | 1 of 2                                | Part # 57033 Lot # 111323   |
|---|---------------------------------------|---|
| ő   | 230 240 250 26                        | m/z-> 210 220 2   |
|   |                                       | 0<br>0<br>0   |
| 160 170 180 190 200   | 130 140 150 1                         | m/≥-> 110 120 1   |
|   |                                       | N<br>m<br>4   |
| 80 70 80 100  | 90<br>40<br>50                        | 5.0E4   |
|   |                                       | - 1<br>.0<br>m<br>B   |
|   | 34.433 seo]:57033.D# [Count] [Linear] | [1] Spectrum No.1 [ 34.433<br>2.0E5                                   |
| 1000.0 2.0 7440-38-2 0.5 mg/m3 orl-rat  | 400.0 0.084 1000                      | 1. Arsenic (As) 58133 020522 0.1000                                   |
| Expanded <b>SDS Information</b><br>Final Uncertainty (Solvent Safety Info. On Attached pg.)<br><u>nL) Conc. (ug/mL) +/- (ug/mL) CAS</u> # OSHA PEL (TWA) LD50 | 11                                    | Part Lot Dilution<br>Compound Number Number Factor                    |
| Reviewed By: Pedro L. Rentas 111323   | 0.06 Flask Uncertainty                | Volume shown below was diluted to (mL): 4000.0                        |
| Hedre Fenter  |                                       |   |
| Id Acid Formulated By: Lawrence Barry 111992  | 24002546 Nitric Acid<br>2.0% 80.0     | Description: <u>Arsenic (As)</u>                                      |
| п<br>(  | Lot <b>#</b> Solvent:                 |   |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com  | Certified Reference Material CRM      | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com |

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**Certified Reference Material CRM** 



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

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

| Cd         A002         Dy         A002         Hf         A002         Li         A002           Ca         A02         Er         A02         Hf         A002         Li         A002           Ca         A02         Er         A02         Hf         A002         Li         A002           Ca         A02         Er         A02         Hf         A002         Li         A002           Ca         A02         Gd         A002         In         A002         Mg         A001           Ca         A02         Ge         A002         Fe         A02         Mg         A002           Ca         A02         Ge         A022         Hg         A02         Hg         A02           Ca         A02         Au         A02         Fe         A02         Hg         A02           Ca         Au         Au         Au2         Fe         Au2         Mg         Au  | 4002       Cl       4002       Cl       4002       Cl       4002       Cl       4002       Fr       4002         T       Ca       402       Er       4002       Hr       4002       Li       4002       Fr       4002         T       Ca       402       Er       4002       Hr       4002       Li       4002       Fr       4002         4002       Ca       402       Er       4002       Hr       4002       Nh       4002       Fr       4002         4002       Ca       4002       Fr       4002       Mr       4002       Nh       4002       Re       4002         4002       Ca       4002       Fr       4002       Mr       4002       Rh       4002         4002       Ca       4002       Fr       402       Hr       4002       Rh       4002         4002       Ca       4002       Fr       402       Hr       4002       Rh       4002         4002       Ca       4002       Fr       4002       Rh       4002       Sh       4002         4002       An       4002       Fr       4002       Rh       400  | ADM2       CA       ADM2       Dy       ADM2       Hf       ADM2       Li       ADM2       Ni       ADM2       Pr         T       Ca       AD2       Er       ADM2       Hf       ADM2       Li       ADM2       Ni       ADM2       Pr       ADM2         T       Ca       AD2       Er       ADM2       Hf       ADM2       Li       ADM2       Ni       ADM2       Pr       ADM2         ADM2       Ca       ADM2       Er       ADM2       Hf       ADM2       Li       ADM2       Ni       ADM2       Pr       ADM2         ADM2       Ca       ADM2       Er       ADM2       Ir       ADM2       Ni       ADM2       Pr       ADM2         ADM2       Ca       ADM2       Fr       ADM2       Mr       ADM2       Rit       ADM2         ADM2       Ca       ADM2       Fr       ADM2       Mr       ADM2       Rit       ADM2         ADM2       Ca       ADM2       Fr       ADM2       Rit       ADM2       Rit       ADM2         ADM2       Ca       ADM2       Rit       ADM2       Rit       ADM2       Rit       ADM2  | ADV2       CA       ADV2       Dy       ADV2       Hf       ADV2       Li       ADV2       Ni       ADV2       Pr       ADV2         T       Ca       ADV2       Ei       ADV2       Hf       ADV2       Li       ADV2       Ni       ADV2       Pr       ADV2         T       Ca       ADV2       Ei       ADV2       Hf       ADV2       Li       ADV2       Ni       ADV2       Pr       ADV2         ADV2       Ca       ADV2       Ei       ADV2       In       ADV2       Nih       ADV2       Re       ADV2         ADV2       Ca       ADV2       Ca       ADV2       In       ADV2       Mg       ADV1       OS       ADV2       Re       ADV2         ADV2       Ca       ADV2       Fe       ADV2       Mg       ADV2       Re       A   | -               | ÷     |   | 20.05 | 18 | 20.02 | ę   | 191          | Ŀ            |       |    |       | ŀ          |   | I   |       |        |       |            |
|--|--|---|---|-----------------|-------|---|-------|----|-------|-----|--------------|--------------|-------|----|-------|------------|---|-----|-------|--------|-------|------------|
| 4002       Cd       4002       Dy       4002       Hf       4002       Li       4002       Nh         4002       Ca       402       Er       4002       Hf       4002       Li       4002       Nh         7       Ca       402       Er       4002       Ho       4002       Li       4002       Nh         4002       Ca       4002       Er       4002       In       4002       Nh       4002       Re         4001       Cr       4002       Gd       4002       Ir       4002       Mg       4001       08       4002       Rh         4001       Cr       4002       Gd       4002       Fr       4002       Mg       4002       Rh         4002       Ge*       4002       Fe       402       Hg       402       P       4002       Rh         4002       Ge*       4002       Li       4002       Mo       4002       Rh  | 4002         Cd         4002         Dy         4002         Hr         4002         Li         4002         Pr           4002         Ca         402         Dy         4002         Hr         4002         Ni         4002         Pr           4002         Ca         402         Er         4002         Hr         4002         Li         4002         Pr           4002         Ca         4002         Er         4002         Hr         4002         Ni         4002         Pr         4002           4001         Ca         4002         Er         4002         Ir         4002         Ni         4002         Re         4002           4001         Ca         4002         Fr         402         Mg         4001         Os         4002         Re         4002           4002         Ca         4002         Fr         402         Mg         402         P         4002         Ru         4002           4002         Ca         4002         Fr         402         Mg         402         Ru         4002         Sm         4002         Sm         4002         Sm         4002         Sm         4002   | AD02         CA         AD02         Dy         AD02         Hf         AD02         Li         AD02         N         AD02         Fr         AD02 <td>Ann         Ann         Ann<td>3</td><td>3</td><td></td><td>-</td><td>4</td><td>3</td><td>s</td><td>3</td><td>~</td><td></td><td>K</td><td>A).02</td><td>3</td><td><b>4</b>0.02</td><td>Au</td><td>&lt;0.02</td><td>ß</td><td>20.02</td><td>t</td></td> | Ann         Ann <td>3</td> <td>3</td> <td></td> <td>-</td> <td>4</td> <td>3</td> <td>s</td> <td>3</td> <td>~</td> <td></td> <td>K</td> <td>A).02</td> <td>3</td> <td><b>4</b>0.02</td> <td>Au</td> <td>&lt;0.02</td> <td>ß</td> <td>20.02</td> <td>t</td> | 3               | 3     |   | -     | 4  | 3     | s   | 3            | ~            |       | K  | A).02 | 3          | <b>4</b> 0.02   | Au  | <0.02 | ß      | 20.02 | t          |
| A002       Cd       A002       Dy       A002       Hf       A002       Li       A002       Ni       A002       Pr         A002       Ca       A02       Er       A002       Ho       A002       Li       A002       Ni       A002       Pr         A002       Ca       A02       Er       A002       Ho       A002       Li       A002       Ni       A002       Re         A001       Cr       A002       Gd       A002       Ir       A002       Mg       A001       Os       A002       Rh         A001       Cr       A002       Gd       A002       Fe       A002       Mg       A002       Rh         A001       Cr       A002       Ga       A002       Fe       A02       Hg       A02       Rh         A003       Cr       A002       Fe       A02       Hg       A002       Rh   | ADD2         Cd         ADD2         Dy         ADD2         Hf         ADD2         Li         ADD2         N         ADD2         Pr         ADD2           T         C4         AD2         Er         AD2         Hf         AD2         Li         AD2         Pr         AD2         Pr         AD2         AD2         Nh         AD2         Pr         AD2         AD2         Nh         AD2                                     | Aug       A   | If accordingMetalsVertrication by ICP-MS ( $\mu g/mL$ ) $40n^2$ $6n^2$ $6n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $40n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $40n^2$ $6n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $6n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $6n^2$ $11$ $40n^2$ $11$ $11$ $40n^2$ $11$ $40n^2$ $11$ $40n^2$ $11$ <   | <0.02 Sn        | 40.02 |   | _     | -  | A.02  | Si  | <0.02        | P            | 20.0Z | Mo | 20.02 | 5          | 20.02   | g   | 20.02 | 2      | 2002  | 9 <u>5</u> |
| 4002         Cd         4002         Dy         4002         Hf         4002         Li         4002         Ni         4002         Pr           4002         Ca         402         Er         4002         Hf         4002         Li         4002         Pr           4002         Ca         4002         Er         4002         Ho         4002         Li         4002         Re           4001         Cr         4002         Gd         4002         Ir         4002         Mg         4001         Os         4002         Re           4001         Cr         4002         Gd         4002         Ir         4002         Mg         4001         Os         4002         Rh           4001         Cr         4002         Gd         4002         Ir         4002         Mg         4002         Rh           4001         Cr         4002         Gd         4002         Ir         4002         Rh         4002         Rh           4001         Cr         4002         Rt         4002         Rh         4002         Rh         4002         Rh | ADD2         Cd         ADD2         Dy         ADD2         Hf         ADD2         Li         ADD2         Ni         ADD2         Pr         ADD2           T         Cc         ADD2         Er         ADD2         Hf         ADD2         Li         ADD2         Ni         ADD2         Pr         ADD2         Re         ADD2                   | Aug       A   | A002       C4       A002       Dy       A002       Hf       A002       Li       A002       Ni       A002       Pr       A002         T       Ca       A02       Er       A02       Hf       A022       Li       A022       Nb       A022       Pr       A022         A001       Ca       A02       Er       A022       In       A002       Li       A022       Nb       A022       Re       A022         A001       Cr       A022       Gd       A022       In       A022       Nb       A022       Re       A022         A001       Cr       A022       Gd       A022       In       A022       Nb       A022       Re       A022         A001       Cr       A022       Ir       A022       Ma       A022       Re       A022         A001       Cr       A022       Re       A022       Re       A022       Re       A022  | <0.02 Tm        | 40,02 |   | _     | s  | -0.02 | Ru  | <0.02        | <del>ب</del> | 20.2  | 8u | 2     | . 14       | 20.02   | ) ¢ | 3 2   | 3 1    | 2003  | R !        |
| 4002         Cd         4002         Dy         4002         Hf         4002         Li         4002         Ni         4002         Pr           4002         Ca         402         Er         4002         Hf         4002         Li         4002         Ni         4002         Pr           4002         Ca         4002         Er         4002         Ho         4002         Li         4002         Ni         4002         Re           4002         Ca         4002         Eu         4002         In         4002         Mg         4001         Os         4002         Re           4002         Ca         4002         Eu         4002         In         4002         Mg         4001         Os         4002         Re   | ADD2         Cd         ADD2         Dy         ADD2         Hf         ADD2         Li         ADD2         Ni         ADD2         Pr         ADD2           T         Ce         ADD2         Er         ADD2         Hf         ADD2         Li         ADD2         Ni         ADD2         Pr         ADD2           T         Ce         ADD2         Er         ADD2         Li         ADD2         Ni         ADD2         Re         ADD2           ADD2         Cs         ADD2         En         ADD2         In         ADD2         Ni         ADD2         Re         ADD2           ADD2         Cs         ADD2         En         ADD2         In         ADD2         Ni         ADD2         Re         ADD2           ADD2         Cs         ADD2         In         ADD2         Mg         ADD1         Os         ADD2         Rh         ADD2  | AD02       Cd       AD02       Dy       AD02       Hf       AD02       Li       AD02       Ni       AD02       Pr       AD02         T       Ca       AD2       Et       AD02       Hf       AD02       Li       AD02       Ni       AD02       Pr       AD02         T       Ca       AD02       Et       AD02       Hf       AD02       Li       AD02       Ni       AD02       Re       AD02         AD02       Ca       AD02       Et       AD02       In       AD02       Ni       AD02       Re       AD02         AD02       Ca       AD02       Et       AD02       In       AD02       Ni       AD02       Re       AD02         AD02       Ca       AD02       In       AD02       Mg       AD01       Os       AD02       Rh       AD02  | ADD2         CA         ADD2         Dy         ADD2         Hf         ADD2         LI         ADD2         NI         ADD2         Pr         ADD2           T         Ca         AD2         Er         ADD2         Hf         ADD2         LI         ADD2         Nb         ADD2         Pr         ADD2           ADD2         Ca         ADD2         Er         ADD2         LI         ADD2         Nb         ADD2         Re         ADD2           ADD2         Ca         ADD2         Er         ADD2         LI         ADD2         Nb         ADD2         Re         ADD2           ADD2         Ca         ADD2         In         ADD2         Mg         ADD1         Os         ADD2         Rh         ADD2           ADD2         Ca         ADD2         In         ADD2         Nb         ADD2         Rh         ADD2         Rh         ADD2   | 1 40.2 Th 40.02 | 40.2  | - |       | N  | 40.02 | KO  | 20.02        | 2            | 20.02 |    | 10.02 | <b>1</b>   | 3 8   | 5 ( | 3     | ç      | A001  | F.         |
| 40.02         Cd         40.02         Dy         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr           40.02         Ca         40.2         Er         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr           T         Ce         40.02         Eu         40.02         In         40.02         Ma         40.02         Re           T         Ce         40.02         Eu         40.02         In         40.02         Ma         40.02         Re   | 40.02         Cd         40.02         Dy         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02           T         Ce         40.02         Er         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02         Ann         Ann         Ann         40.02         Ann         40.02         Ann         40.02         Ann         40.02         40.02 | 40.02         Cd         40.02         Dy         40.02         Hr         40.02         Li         40.02         Ni         40.02         Pr         40.02           T         Ca         40.2         Er         40.02         Hr         40.02         Li         40.02         Ni         40.02         Pr         40.02           T         Ca         40.2         Er         40.02         In         40.02         Ni         40.02         Re         40.02           T         Ca         40.02         En         40.02         In         40.02         Ni         40.02         Re         40.02   | If ace metals verification by ICP-MS (µg/mL)         4002       C4       4002       Dy       4002       Hf       4002       Li       4002       Ni       4002       Pr       4002         T       Ce       4002       En       4002       Hf       4002       Li       4002       Ni       4002       Pr       4002         T       Ce       4002       En       4002       In       4002       Ni       4002       Re       4002         T       Ce       4002       En       4002       In       4002       Ni       4002       Re       4002   | 11 70'05        | 20.02 | _ |       | 2  | 40.02 | 2 2 | 0.02         | 2 9          | 3     |    | 53    | <b>-</b> 1 | <n n2<="" td=""><td>£</td><td>40.02</td><td>ດ<br/>ດ</td><td>40.02</td><td>Ba</td></n> | £   | 40.02 | ດ<br>ດ | 40.02 | Ba         |
| 40.02         Cd         40.02         Dy         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr           40.02         Ca         40.2         Er         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr           40.02         Ca         40.2         Er         40.02         Ho         40.02         Li         40.02         Nb         40.02         Re  | 40.02         Cd         40.02         Dy         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02           40.02         Ca         40.2         Er         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02   | 40.02         Cd         40.02         Dy         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02           40.02         Ca         40.2         Er         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02           40.02         Ca         40.2         Er         40.02         H6         40.02         Li         40.02         Ni         40.02         Re         40.02<   | 40.02         Cd         40.02         Dy         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02         Re         40   |                 |       |   |       | _  | 3     | D.  | 4000         | ò            | 4001  | Ma | 40.02 | 2,         | <b>40.02</b>  | 말   | <0.02 | ନ      | T     | As         |
| 40.02 Cd 40.02 Dy 40.02 Hr 40.02 Li 40.02 Ni 40.02 Pr  | 40.02 Cd 40.02 Dy 40.02 Hr 40.02 Li 40.02 Ni 40.02 Pr 40.02  |   | If ace metals verification by ICP-MS (µg/mL)       If ace metals verification by ICP-MS (µg/mL)   | 40.02 Te        | 40.02 | _ | 22    |    | A.2   | Re  | <b>4</b> .02 | 3            | 40.02 | E  | <0.02 | Но         | 20.02   | Ę   | 7.05  | ç      | 20.02 | - 2        |
|  |  |   | I and I and I by I and I if and I if and I we I and I CP-MS (Jug/mL)  | A0.2 Tb         | 40.2  |   | ŝ     | -  | 40.02 | គ   | 20.02        | INI          | 70.02 | F  | 10.02 | ;          |   | 1   | 5     | 2      | 3     | <u></u>    |
|  |  |   | I race Metais Verification by ICP-MS (µg/mL)  | l               | l     | l |       |    |       |     | 5            |              | 2000  |    | 2003  | H          | 2002  | Ŗ   | A).02 | 2      | 40.02 | A          |

(T) = Target analyte

Physical Characterization:

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

Low P. S.

**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 Lot # 111323

| andrade.com     In the property of the prope   | m/z-> | 2500 | m/z-> | 500 | m/z->    | י.<br>ס<br>ג<br>ג<br>ג<br>ג | 5.0E4         | 1. Ammonium dihydrogen phosphate (P) | Compound  | Description:<br>Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below wa | CERTIFIED WEIGHT REPORT:<br>Par<br>Lo | www.absolutestandards.com |
|--|-------|------|-------|-----|----------|-----------------------------|---------------|--------------------------------------|---|--|---------------------------------------|---------------------------|
| R I R Z R Z M RZ R M Z R I WINC AND         Lari         Revenue V M Z R I WINC AND         Revenue V M   | 210   |      | 110   |     | 0        |                             | [1] Spectrum  |                                      | _   | Description:<br>Expiration Date:<br>Recommended Storage:<br>Concentration (µg/mL):<br>NIST Test Number:<br>Weight shown below was d      | Part Number:<br>Lot Number:           | om                        |
| RICZINGLA         MSRID  | 220   |      | 120   |     | N<br>O   |                             | -             |                                      | Lot<br>Number   | Phosphore<br>041726<br>Ambient (20<br><b>10000</b><br>6UTB<br>6UTB   | <u>57115</u><br>041723                | S.                        |
| Multical Actual     Formulated By:     Lawrence Barn       Formulated By:     Pedro L. Renta       Reviewed By:     Pedro L. Renta       Actual     Actual     Uncertainty       (Solvent Safety Info.     20.0     7722-76-1       5 mg/m3     5 mg/m3       160     170     180  | 230   |      | 130   |     | ۵        |                             | 2.074 sec]:58 |                                      |   | (P)  |                                       | R                         |
| thic Acid<br>Find Acid<br>Formulated By: Lawrence Barn<br>Reviewed By: Pedro L. Renta<br>Lippanded<br>Actual Actual Uncertainty (Solvent Safety Info.<br>eight (g) Conc. (ug/mL) CAS# OSHA PEL (T)<br>2.7299 10000.0 20.0 7722-76-1 5 mg/m3<br>2.7299 10000.0 20.0 7722-76-1 5 mg/m3<br>2.7299 10000.0 1100 eio  | 240   |      | 140   |     | <b>6</b> |                             | 1115.D# [Cou  |                                      | Uncertainty Assay<br>Purity (%) (%)                   | 2%<br>Balance Uncertainty<br>Flask Uncertainty   | Solvent:                              | 2109/12                   |
| To so so to  | 250   |      | 150   |     | U,<br>O  |                             | ınt] [Linear] |                                      |   |  | Lot #                                 | 4 4                       |
| ht<br>Formulated By: Lawrence Barn<br>Neviewed By: Pedro L. Renta<br>Expanded<br>Uncertainty<br>   | 260   |      |       |     |          |                             |               | 2.7289 10000                         | actual Actual Actual Actual                           | tric Acid  | tric Acid                             | 15815                     |
| the second secon |       |      |       |     | 1        |                             |               | 20.0                                 |   | Formulated I   | Q                                     |                           |
| noe Barry 041723<br>L. Rentas 041723<br>So Information<br>fety Info. On Attached pg.)<br>A PEL (TWA) LDSO<br>5 mg/m3 orl-rat >2000mg/kg<br>5 o 200   |       |      | 4     |     |          |                             |               |                                      | SI<br>(Solvent Sa<br>CAS# OSH                         | Y: Law   | derme !                               | 5                         |
| o o<br>o o<br>o o<br>o o<br>o o<br>o o<br>o o<br>o o   |       |      |       |     |          |                             |               |                                      | DS Information<br>Ifety Info. On Atta<br>IA PEL (TWA) | I. Rentas  | pr 1                                  | https://A                 |
|  |       |      | o     |     | 0        |                             |               |                                      | 0   |  |                                       | bsolutestanda             |

| <b>Abs</b> | Absolute (<br>800-368-1131<br>www.absolute                  | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com | <b>lards</b><br>ds.com  | , Inc.   |   |   |  |  | Ce   | rtified Re   | oferen                             | Certified Reference Material CRM                      | ial CR             | M   |                     |                        |              | •                             | https         | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | 4 Accredited<br>cate Number<br>andards.com |
|------------|---|---|---|--|---|---|--|--|--|--|------------------------------------|---|--------------------|---|---------------------|------------------------|--------------|-------------------------------|---------------|--|--|
| -          | instrum   | nental A  | nalysi  | s by Ind   | luctive   | sly Coupl   | ed Pla   | Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);  | s Spec   | stroscopy  | (ICP                               | -MS):   |                    |   |                     |                        |              |                               |               |  |  |
| _          |   |   |   |  |   |   |  | Trace Metals   | etals  | Verifica   | Ition                              | Verification by ICP-MS                                | 1.00               | (µg/mL)   |                     |                        |              |                               |               |  |  |
| -          | A   | 40.02   | 8   | 40.02  | Dy  | 40.02   | Hf   | 40.02  | E  | 40.02  | Z                                  | A.02  | 7                  | A.02  | Se                  | <b>A</b> 2             | ŧ            | A                             |               | A) B   |  |
|            | 8   | A.2   | 2 G   | A012   | រដ  | 40.02   | Но   | 40.02  | Ŀ  | 40.02  | NB                                 | <0.02   | Re                 | 40.02   | ŝ                   | 40.02                  | Te           | 40.02                         | c :           | 40.02  |  |
|            | As<br>Ba  | 40.02<br>202  | ନ୍ଦ   | 8 8 8<br>8 9 9   | <u>ଟ</u> ଜ  | 4<br>00<br>02   | 4 4  | 002<br>002   | Mg<br>Mg   | 40.01<br>02  | ¥ 9                                | A A 8   | r r                | A A<br>3 S  | Å.                  | A. 0.02                | <b>;</b> ; ; | A 60<br>20<br>20              | \$ <          |  |  |
|            | Be  | 40.01   | Ω   | <b>40.02</b>   | ណ្ឌ   | <0.02   | 语  | <0.2   | Hg   | 402  | ÷ ۵.                               | Ť   | R a                | <0.02   | K 2                 | 8.8<br>4               |              | 40.02                         | ¥ '5          | 40.02<br>  |  |
|            | B B   | 0.02<br>02  | <u>ନ</u> ଚ  | 8 8<br>8 8   | ନ<br>ଜ  | A (0)<br>(0)  | 7 F  | 4 4<br>8<br>8  | N M  | 4 4<br>8<br>8  | × 3                                | A0.02   | Sm                 | A A 33  | , s                 | 88                     | : S          | 40.02                         | 28            | 88   |  |
|            |   |   |   |  |   |   |  |  |  | (T)= Te  | (T)= Target analyte                | alyte   | ľ                  |   | ĺ                   |                        |              |                               |               |  |  |
| hand       | physica   | Physical Characterization:  | cteriza   | ation:   |   |   |  |  |  |  |                                    |   |                    |   | •                   |                        |              | Cer                           | Certified by: | y:   |  |
| Ŧ          | Iomogen   | ieity: No   | heterog   | eneity was   | i observ  | ed in the pr  | eparati  | Homogeneity: No heterogeneity was observed in the preparation of this standard.  | andard.  |  |                                    |   |                    |   |                     |                        | (            | A                             | J.            | Ŵ  |  |
| * *        | The ce<br>Purified  | rtified v<br>d acids,<br>enaratio                                     | alue is<br>18.2 m   | The certified value is the concen<br>Purified acids, 18.2 megohm dei<br>the preparation of all standards | centra<br>deioniz   | tion calcu<br>zed water   | lated f  | 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 etandarde  | metric<br>s A gla                                  | ; and volu<br>assware a  | metric<br>nd the                   | measure<br>highest p                                  | ments<br>ourity r  | unless otl<br>aw mater  | nerwiso<br>ials are | e stated.<br>9 used in |              |                               |               |  |  |
| * * * * *  | All stan<br>Standa<br>Standa<br>All Stan<br>Uncert<br>Measu | ndard co<br>Irds are<br>Irds are<br>ainty Re<br>ainty Re              | ontaine<br>prepan<br>certife<br>hould I<br>ference<br>Result, | rs are m<br>ed gravir<br>d (+/-) (<br>be store<br>e: Taylo<br>" NIST T                                   | eticulo<br>netric:<br>0.5% c<br>d with<br>r, B.N.<br>echnic | ally using<br>of the stat<br>caps tigh<br>and Kuya<br>al Note 1 | hed pribalanc<br>balanc<br>ted val<br>t and<br>t, C.E.<br>297, L | <ul> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All Standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* 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).</li> </ul> | re calit<br>i other<br>iropria<br>nes for<br>nment | orated wit<br>wise stat<br>te laborat<br>r Evaluatir<br>Printing ( | h weig<br>ed.<br>ory co<br>Office, | jhts trace<br>onditions.<br>  Expressir<br>  Washingt | able to<br>on, D.o | to NIST (see above).<br>e Uncertainty of NIST<br>D.C. (1994). | e abov<br>ty of N   | e).<br>IIST            |              |                               |               |  |  |
|            |   |   |   |  |   |   |  |  |  |  |                                    |   |                    |   |                     |                        |              |                               |               |  |  |
|            |   |   |   |  |   |   |  |  |  |  |                                    |   |                    | ·   |                     |                        |              |                               |               |  |  |
|            |   |   |   |  |   |   |  |  |  | 8  |                                    |   |                    |   |                     |                        |              |                               |               |  |  |
| Part #     | 57115   |   | Lot # 041723  | 1723   |   |   |  |  |  |  | 2 of 2                             | of 2  |                    |   |                     |                        | Print        | Printed: 2/8/2024, 5:01:22 PM | 24, 5:0       | 11:22 PM   |  |

Printed: 2/8/2024, 5:01:22 PM

|   | -                 | 260                  | 250                  | 240                                      | 230           |                           | 220                                       | 210  | m/z->  |
|---|-------------------|----------------------|----------------------|--|---------------|---------------------------|---|--|--|
|   |                   |                      |                      |  |               |                           |   |  | 1.0巨5。   |
|   |                   |                      |                      |  |               |                           |   |  | 2.0厘5  |
| 180 190 200   | 170               | 160                  | 150                  | 140                                      | 130           | р. 9                      | 120                                       | 110  | m/z->  |
|   |                   |                      |                      |  |               |                           |   |  | 2,5E   |
|   |                   |                      |                      |  |               |                           |   |  | 5.0E5  |
| 80 80 100   | 70                | eo                   | 50                   | <b>40</b>                                | 8             | magan Raji Anana ya Anany | N   | 10   | m/z->  |
|   |                   |                      |                      |  |               |                           |   |  | 1000   |
|   |                   | ear)                 | ount] [Lin           | 24.004 sec];58116,D# [Count] [Linear]    | ¢ sec];58     | [ 24.00                   |   | [1] Spectrum No.1  | 2000   |
| 20.0 7763-20-2 NA orf-rat 4250mg/kg 3181  | 10000.1           | 82,4682              | 82.4675              | 0.10 24.3                                | 99,9          | 10000                     | IN117 SLBR7225V                           | IN1  | 1. Ammonium sulfate (S)  |
| Expanded SDS Information<br>Uncertainty (Solvent Safety Info. On Attached pg.) NIST<br>+/- (ug/mL) CAS# OSHA PEL (TWA) LDSO SRM | (g) Conc. (µg/mL) | Actual<br>Weight (g) | Target<br>Weight (g) | Uncertainty Assay<br>Purity (%) (%)      | Purity<br>(%) | Nominal<br>Conc. (µg/mL)  | Lot.<br>Number                            | RM#  | Compound   |
| i By: Ped   | [F                |                      |                      | Balance Uncertainty<br>Flask Uncertainty | 0.058         | 1999.48                   | led to (mL):                              | Weight shown below was diluted to (mL):  | Weight show  |
| da Terra Barry  | 1 1               |                      |                      |  |               | 20 °C)                    | 071126<br>Ambient (20 °C)<br><b>10000</b> | Expiration Date:<br>nended Storage:<br>htration (µg/mL):   | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): |
| around Bring  | Type 1 Water      | ASTM Ty              | Lot#<br>071123       | Solvent:                                 |               | E)                        | 57116<br>071123<br>Sulfur (S)             | <u>PORT:</u><br>Part Number:<br>Lot Number:<br>Description:  | CERTIFIED WEIGHT REPORT:<br>Part N<br>Lot N<br>Desc                        |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com  | CRM               |                      | ference M            | Certified Reference Material             | R a           |                           |   | om   | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com      |
|   |                   |                      |                      |  |               |                           |   | And in case of the local division of the loc |  |

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com  |  |  | Certified Reference Material CRM                              | ence Material (                               | CRM  |                     |              | ×          | ANA<br>AR-<br>https:/ | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|--|--|--|---|---|--|---------------------|--------------|------------|-----------------------|--|
| Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):  | uctively Couple  | d Plasma Mass S  | Spectrometry (I   | CP-MS):                                       |  |                     |              |            |                       |  |
|  |  | Trace Me   | Metals Verificat  | Verification by ICP-MS                        | VIS (µg/mL)  |                     |              |            |                       |  |
| AI <0.02 Cd <0.02  | Dy <0.02   | Hr   | -18   |   |  | ALL DAY OF          | A NEW YORK   |            | 「「「「「「「」」」            |  |
| 4).02<br>C.  |  |  |   | Ni <0.02                                      | Pr <0.02<br>Re <0.02                                       | Si Se               | 40.2<br>40.2 | 다 다        | A A.02                | W <0.02  |
|  | Gd 40.02   | In <0.02   | Mg <0.01<br>Mn <0.02  | Pd 40.02                                      |  | Ag                  | A 0.02       | 133        |                       |  |
|  |  | Fe 40.2  | Hg <0.2<br>Mo <0.02   |   |  | ν ų                 | - 0.02       | 7 2 2      |                       |  |
|  | 70.02  | 20105 0.1  | ND 20.02  | K <0.2  |  | Ta                  | <0.02        | H          | 40.02                 | Zr 40.02   |
| ruysical Cnaracterization:   |  |  |   | a mary no                                     |  |                     |              | ~          | Certified by:         |  |
| Homogeneity: No heterogeneity was observed in the preparation of this standard.  | bserved in the prep                                    | paration of this standa                                      | ud.   |   |  |                     |              |            |                       |  |
| -  |  |  |   |   |  |                     | ,            | the second | Je Je                 |  |
| <ul> <li>The certified value is the concentration calculated from gravimetric and volumetric measurements</li> <li>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity in the preparation of all standards.</li> <li>All standard containers are maticulated class A glassware and the highest purity in the preparation of all standards.</li> </ul> | Intration calcula<br>Bionized water, (<br>S.           | ted from gravime<br>calibrated Class A                       | tric and volumet<br>glassware and t                           | ric measuremen<br>he highest purit            | ts unless otherwise stated.<br>Y raw materials are used in | wise sta<br>are use | ited.<br>in  |            |                       |  |
| * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>* All standards about the stated value, unless otherwise stated.   | etrically using b<br>5% of the state                   | alances that are c<br>d value, unless ot                     | alibrated with we<br>herwise stated.                          | sights traceable                              | to NIST (see a   | bove).              |              |            |                       |  |
| * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.  | with caps tight<br>B.N. and Kuyat,<br>chnical Note 12: | and under approp<br>, C.E., "Guidelines<br>97, U.S. Governme | riate laboratory (<br>for Evaluating ar<br>ent Printing Offic | conditions.<br>nd Expressing the, Washington, | ne Uncertainty of NIST<br>D.C. (1994).                     | of NIST             |              |            |                       |  |
|  |  |  |   |   |  |                     |              |            |                       |  |
|  |  | 3  |   |   |  |                     |              |            |                       |  |

2 of 2

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





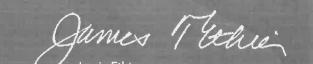


Material No.: 3624-01 Batch No.: 0000281938 Manufactured Date: 2021-06-07 Retest Date: 2026-06-07 Revision No.: 1

## **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     |
| Iron (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



Jamie Ethier 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 Mansford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700



### **Certificate of Analysis**

R: 02/22/24 M.5942

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:                    | CGTI1                                |  |  |  |  |  |
| Lot Number:                        | T2-TI719972                          |  |  |  |  |  |
| Matrix:                            | 2% (v/v) HNO3<br>tr. HF              |  |  |  |  |  |
| Value / Analyte(s):                | 1 000 μg/mL ea:<br>Titanium          |  |  |  |  |  |
| Starting Material:                 | Ti Metal                             |  |  |  |  |  |
| Starting Material Lot#:            | 2094                                 |  |  |  |  |  |
| Starting Material Purity:          | 99.9975%                             |  |  |  |  |  |
| CERTIFIED VALUES AND UNCERTAINTIES |                                      |  |  |  |  |  |

| Certified Value: | 1002 ± 5 μg/mL                     |
|------------------|------------------------------------|
| Density:         | 1.012 g/mL (measured at 20 ± 4 °C) |

. . .. . . . . . . . . .

**Assay Information:** 

3.0

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

- 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   | Characterization of CRM/RM by One Method  |
|---|---|
| Certified Value, $X_{\mbox{CRM/RM}}$ , where two or more methods of characterization are used is the weighted mean of the results:  | Certified Value, X <sub>CRMRM</sub> , where one method of characterization<br>is used is the mean of individual results:  |
| $\begin{split} & \textbf{X}_{CRM/RM} = \Sigma(w_i) \; (\textbf{X}_i) \\ & \textbf{X}_i = \text{mean of Assay Method } i \; \text{with standard uncertainty } \textbf{u}_{char \; i} \\ & \textbf{w}_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & \textbf{w}_i = (1/u_{char \; i})^2 / (\Sigma(1/(u_{char \; i})^2)) \end{split}$  | $X_{CRM/RM} = (X_a) (u_{char a})$<br>$X_a = mean of Assay Method A withu_{char a} = the standard uncertainty of characterization Method A$  |
| CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k ( $u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts}$ ) <sup>Y<sub>2</sub></sup><br>k = coverage factor = 2<br>$u_{char} = [\Sigma((w_i)^2 (u_{char}_i)^2)]^{Y_2}$ where $u_{char}$ is the errors from each characterization method $u_{bb}$ = bottle to bottle homogeneity standard uncertainty<br>$u_{tts}$ = long term stability standard uncertainty (storage)<br>$u_{tts}$ = transport slability standard uncertainty | CRMRM Expanded Uncertainty (±) = U <sub>CRMRM</sub> = k ( $u^2_{char  e} + u^2_{bb} + u^2_{lts} + u^2_{ts}$ ) <sup>1/2</sup><br>k = coverage factor = 2<br>uchar e = the errors from characterization<br>u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty<br>u <sub>lts</sub> = long term stability standard uncertainty (storage)<br>u <sub>ts</sub> = transport stability standard uncertainty |

Page 1 of 4

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### **4.2 Balance Calibration**

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

### **4.3 Glassware Calibration**

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

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

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

| М | Ag | < | 0.000536 | Μ | Eu   | < | 0.000268 | 0 | Na | < | 0.032670 | Μ | Se |   | 0.001204 | 0 | Zn | < | 0.003267 |   |
|---|----|---|----------|---|------|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|
| 0 | AI |   | 0.000872 | 0 | Fe   |   | 0.003225 | 0 | Nb | < | 0.043560 | 0 | Si |   | 0.004735 | 0 | Zr | < | 0.043560 | ŧ |
| М | As | < | 0.008586 | М | Ga   | < | 0.000268 | Μ | Nd | < | 0.000268 | Μ | Sm | < | 0.000268 |   |    |   |          |   |
| Μ | Au | < | 0.004577 | Μ | Gd   | < | 0.000268 | 0 | Ni | < | 0.010890 | М | Sn |   | 0.000096 |   |    |   |          |   |
| 0 | В  | < | 0.008929 | М | Ge   | < | 0.002146 | M | Os | < | 0.000269 | 0 | Sr |   | 0.000096 |   |    |   |          |   |
| М | Ba | < | 0.002683 | Μ | Hf   |   | 0.002161 | 0 | P  | < | 0.054450 | М | Та |   | 0.010560 |   |    |   |          |   |
| M | Be | < | 0.005366 | Μ | Hg   | < | 0.003231 | Μ | Pb | < | 0.001073 | Μ | Тb | < | 0.000268 |   |    |   |          |   |
| М | Bi | < | 0.001609 | М | Но   | < | 0.000268 | М | Pd | < | 0.000268 | Μ | Те | < | 0.001341 |   |    |   |          |   |
| 0 | Ca |   | 0.000676 | Μ | In   | < | 0.002683 | Μ | Pr | < | 0.000268 | Μ | Th | < | 0.053663 |   |    |   |          |   |
| М | Cd | < | 0.000268 | Μ | lr – | < | 0.000269 | М | Pt | < | 0.000536 | S | Tī | < |          |   |    |   |          |   |
| М | Се | < | 0.000268 | Μ | κ    |   | 0.001172 | М | Rb | < | 0.000268 | Μ | TI | < | 0.000268 |   |    |   |          |   |
| М | Co | < | 0.004293 | Μ | La   | < | 0.000268 | М | Re | < | 0.000268 | Μ | Tm | < | 0.000268 |   |    |   |          |   |
| М | Cr |   | 0.000752 | 0 | Li   | < | 0.027225 | M | Rh | < | 0.000268 | M | U  | < | 0.000268 |   |    |   |          |   |
| М | Cs | < | 0.000268 | М | Lu   | < | 0.000268 | Μ | Ru | < | 0.000269 | M | V  | < | 0.019855 |   |    |   |          |   |
| 0 | Cu | < | 0.010890 | 0 | Mg   | < | 0.005445 | i | S  | < |          | Μ | W  |   | 0.000473 |   |    |   |          |   |
| M | Dy | < | 0.000268 | 0 | Mn   | < | 0.003267 | M | Sb | < | 0.006976 | Μ | Y  | < | 0.002146 |   |    |   |          |   |
| Μ | Er | < | 0.000268 | Μ | Мо   |   | 0.000774 | 0 | Sc | < | 0.004900 | М | Yb | < | 0.000536 |   |    |   |          |   |
|   |    |   |          |   |      |   |          |   |    |   |          |   |    |   |          |   |    |   |          |   |

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 - 47.87 +4 6 Ti(F)6-2 Chemical Compatibility - Soluble in concentrated HCl, HF, H3PO4 H2SO4 and HNO3. 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 the hydrated oxide in all dilute acids except HF.

**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 single element solutions as the Ti(F)6-2 chemically stable for years in 2-5% HNO3 / trace HF in an LDPE container.

**Ti Containing Samples (Preparation and Solution) -** Metal (Soluble in H2O / HF caution -powder reacts violently); Oxide - low temperature history anatase or rutile (Dissolved by heating in 1:1:1 H2O / HF / H2SO4); Oxide - high temperature history (~800EC) brookite (fuse in Pt0 with K2S2O7); Ores ( fuse in Pt0 with KF + K2S2O7 - no KF if silica not present); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve by heating with 1:1:1 H2O / HF / H2SO4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite crystalline form).

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 48 amu      | 14 ppt                  | N/A   | 32S16O, 32S14N,                             |
|                    |                         |       | 14N16O18O,                                  |
|                    |                         |       | 14N17N2, 36Ar12C,                           |
|                    |                         |       | 48Ca, [96X=2                                |
|                    |                         |       | (where X = Zr, Mo,                          |
|                    |                         |       | Ru)]  |
| ICP-OES 323.452 nm | 0.0054 / 0.00092 µg/mL  | 1     | Ce, Ar, Ni                                  |
| ICP-OES 334.941 nm | 0.0038 / 0.000028 µg/mL | 1     | Nb, Ta, Cr, U                               |
| ICP-OES 336.121 nm | 0.0053 / 0.000034 µg/mL | 1     | W, Mo, Co                                   |

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**

June 17, 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

- June 17, 2027
- The date after which this CRM/RM should not be used.

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

### 11.3 Period of Validity

- Sealed TCT Bag Open Date: \_

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

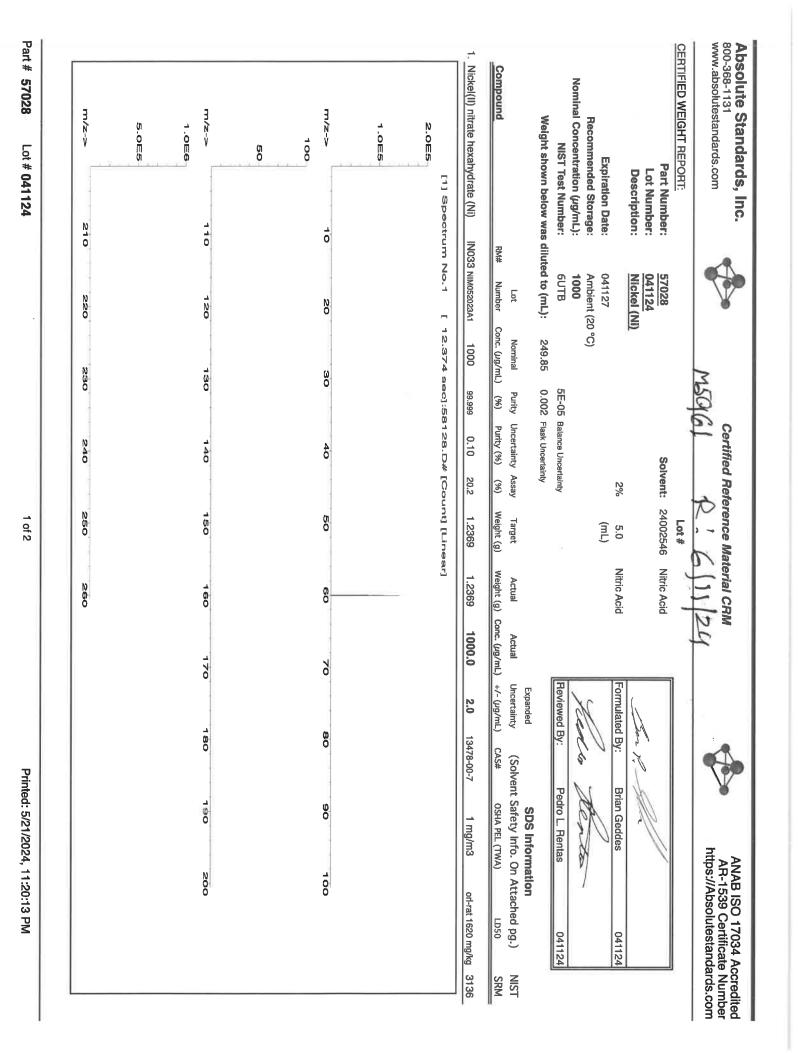
**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

DD978ti

### **Certifying Officer:**

**Paul Gaines** Chairman / Senior Technical Director



|   | Ho   | Ph                         |                      | B<br>Bi<br>B            | As<br>Ba  | 2               | 1 5   | Absc<br>800-36<br>www.at   |
|---|--|----------------------------|----------------------|-------------------------|---|-----------------|---|--|
| The cer<br>Purified<br>the pre<br>All stan<br>Standar<br>Standar<br>Standar<br>Jncerta  | mogene   | ıysical                    |                      |                         |   |                 | strum   | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
| acids,<br>paratic<br>dard co<br>dard co<br>dard sare<br>dards are<br>dards s<br>dards s   | ity: No ]  | Physical Characterization: |                      | <0.01<br><0.02          | <0.02<br><0.2<br><0.02  | 40.02           | ental A   | Absolute Standards<br>800-368-1131<br>www.absolutestandards.com                          |
| alue is<br>18.2 n<br>n of al<br>prepar<br>certife<br>certife<br>ferenc<br>ferenc  | heteroge   | octeriz                    |                      | 5 S S                   | ଦୁ ଦୁ ଦୁ  | Ca              | nalysi  | ds.com   |
| The certified value is the concen<br>Purified acids, 18.2 megohm deio<br>the preparation of all standards.<br>All standard containers are metic<br>Standards are prepared gravimet<br>Standards are certifed (+/-) 0.59<br>Standards should be stored w<br>All standards should be stored w<br>Uncertainty Reference: Taylor, E<br>Measurement Result," NIST Tech   | neity was  | ation:                     |                      | 40.02<br>40.02          | <0.2<br><0.02   | A.2             | s by Indu   | , Inc.   |
| entrati<br>deionize<br>ds.<br>ds.<br>sticulou<br>netrical<br>netrical<br>i with c<br>f with c<br>f with c   | observed   |                            |                      | A Ga                    | 운 딸 탁 J   | Dv              | uctivel   |  |
| The certified value is the concentration calculated from gravi<br>Purified acids, 18.2 megohm deionized water, calibrated Clas<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that ar<br>Standards are certifed (+/-) 0.5% of the stated value, unless<br>All standards should be stored with caps tight and under app<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin<br>Measurement Result," NIST Technical Note 1297, U.S. Gover  | l in the prep  |                            |                      | <0.02<br><0.02<br><0.02 | <0.02   | A) 02           | y Couple  |  |
| calibra<br>calibra<br>ed prio<br>palance<br>and ur<br>and ur<br>c, C.E.,<br>c, C.E.,  | paration   |                            |                      | Fe<br>La                | F F H   |                 | d Plas  |  |
| The certified value is the concentration calculated from gravimetric and volumetric measury<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights trac<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Express<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washing  | Homogeneity: No heterogeneity was observed in the preparation of this standard |                            |                      | <0.2<br><0.02           | 40.02<br>20.02  |                 | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): |  |
| A glass<br>A glass<br>calibra<br>calibra<br>s for E<br>s for E<br>s for E   | lard.  |                            |                      | Hg<br>Mo<br>Nd          | Mn<br>Mn  | Metals          | Spectr  | Certif   |
| nd volume<br>ware and<br>ted with<br>se stated<br>laborator<br>valuating<br>Valuating Of  |  |                            | (T) = Ta             | <0.2<br><0.02           | 40.02<br>40.02  | Verific         | ometry ()   | ied Refe   |
| etric m<br>I the hi<br>weight<br>I.<br>y cond<br>and Ex<br>and Ex   |  |                            | (T) = Target analyte | х P P                   | Pd Os Nb  | ation           | ICP-M   | rence  |
| <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.</li> <li>* 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.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).</li> <li>* Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* All standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* 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).</li> </ul> |  |                            | ılyte                | <0.02<br><0.02<br><0.2  | <0.02   | Ann I Ni T I PT | IS):  | Certified Reference Material CRM   |
| to NIS<br>b.C. (  |  |                            |                      | Ru<br>Sm<br>Sc          | Rb Rb   | MS (            |   | CRM  |
| ertainty of NIST<br>1994).  |  |                            |                      | 40.02<br>40.02          |   | Jg/mL)          |   |  |
| are use<br>ove).<br>f NIST  |  |                            |                      | Sr<br>Ta                | Ag Si   | 2               |   |  |
| 3d in   |  |                            |                      | 40.02<br>40.02          | 40.02<br>10<br>10   | Ĵ.              |   | •  |
|   |  |                            |                      | T Sn Tm                 | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | 7               |   | × ×  |
|   | ar 1   | Certified by:              |                      | <0.02<br><0.02          | <pre>&lt;0.02</pre>   | 6               |   | http://  |
|   | M  | by:                        |                      | Zn<br>Zr                | <b>५</b> २दः  | w               |   | NAB IS<br>R-1530<br>s://Abs  |
|   | -lls   |                            |                      |                         |   | 3               |   | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|   |  |                            |                      |                         |   |                 |   | Accredit<br>te Numb<br>dards.co  |
|   |  |                            |                      |                         |   |                 |   | 1 3 6 8  |

|     | m/z-> 210 | 1.0E8 | N.<br>O<br>E<br>B | m/z-≻ 110 | -1<br>-0<br> | m/z-> 10<br>2.0E8 | 1.0<br>[[]4 | [1] Spectrum No.1<br>2.0E4            | 1. Selenium (Se)     | Compound   | Volume shown below was diluted to (mL):  | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): | Lot Number:<br>Description:    | CERTIFIED WEIGHT REPORT: | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|-----|-----------|-------|-------------------|-----------|--------------|-------------------|-------------|---------------------------------------|----------------------|--|--|--|--------------------------------|--------------------------|--|
|     | 0         |       |                   | 0         |              | J.                |             | um No                                 | 58134                | Part<br>Number   | 6<br>as diluted                          |  |                                | л                        |  |
| 220 |           |       |                   | 120       |              | 12<br>0           |             | -                                     | 071223               | Lot<br>Number  | ed to (mL):                              | 060627<br>Ambient (20 °C)<br>1000  | <u>060624</u><br>Selenium (Se) | 7024                     | V  |
|     | N         |       |                   | 4         |              | ω                 |             | 33.702                                | 0.1000               | Dilution<br>Factor   | 2000.07                                  | ĉ  | (Se)                           |                          |  |
|     | 230       |       |                   | 130       |              | 80                |             | 90c]:58                               | 200.0                | Initial<br>Vol. (mL)   | 5E-05<br>0.100                           |  |                                |                          |  |
|     | 240       |       |                   | 140       |              | 4<br>0            |             | 034.D#                                | 0.084                | Initial Uncertainty<br>Vol. (mL) Pipette (mL)  | Balance Uncertainty<br>Flask Uncertainty |  |                                |                          | Sertified Referen  |
|     | 250       |       |                   | 150       |              | . (л<br>О         |             | 33.702 sec]:58034.D# [Count] [Linear] | 1000                 | Nominal<br>Conc. (µg/mL)   | rtainty<br>nty                           |  | 2.0%                           | Lot #                    | Reference<br>162.  |
|     | 260       |       |                   | 160       |              | 60                |             | inear]                                | 10002.5              | Initial<br>Conc. (µg/mL)   |  | (mL)   | 40.0                           | Solvent:                 | Certified Reference Material CRM<br>からすチェート・アンの  |
|     |           |       |                   | 170       |              | 70                |             |                                       | 1000.0               | Final<br>Conc. (ug/mL)   | 11                                       |  | Nitric Acid                    |                          | 114  |
|     |           |       |                   | ŏ         |              | 0                 |             |                                       | 2.2                  | Expanded<br>Uncertainty<br>+/- (µg/mL)   | Reviewed By:                             | <i>M</i>   | Formulated By:                 |                          | 24   |
|     |           |       |                   | 180       |              | 80                |             |                                       | 7782-49-2            | 0  | ×  | 20   | BY                             |                          |  |
|     |           |       |                   | 190       |              | 90                |             |                                       | 0.2 mg/m3            | SDS Information<br>nt Safety Info. On Att:<br>OSHA PEL (TWA)                         | Pedro L. Rentas                          |  | Benson Chan                    |                          | ਤ  |
|     |           |       |                   | 200       |              | 100               |             |                                       | 3 orl-rat 6700 mg/kg | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br>AS# OSHA PEL (TWA) LDS0 | 1tas 060624                              | ,  | n 060624                       |                          | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|     |           |       |                   |           |              |                   |             |                                       | 3149                 | NIST   | 24                                       | I  | 24                             |                          | Accreditec<br>ate Number<br>Idards.com   |

|  |   |  |  |   |  |  |  |  |   |   |   |  |   |   | 1    |
|--|---|--|--|---|--|--|--|--|---|---|---|--|---|---|------|
|  | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise st.<br>Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are us<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).<br>Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.<br>All standards should be stored with caps tight and under appropriate laboratory conditions.<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST<br>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | rements<br>t purity r<br>ceable to<br>s.<br>s.<br>sing the l<br>ngton, D.0   | highes<br>highes<br>tra<br>ndition:<br>Expres<br>Washir | volumetric<br>re and the<br>i with weij<br>stated.<br>stated.<br>oratory cc<br>uating and<br>ing Office. | ric and glasswa<br>glasswa<br>alibratec<br>nerwise<br>riate lab<br>for Evalu<br>nt Print | <ul> <li>* The certified value is the concentration calculated from gravimetric and volumetric measurements unlee</li> <li>* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw n<br/>the preparation of all standards.</li> <li>* All standard containers are meticulously cleaned prior to use.</li> <li>* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIS</li> <li>* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.</li> <li>* All standards should be stored with caps tight and under appropriate laboratory conditions.</li> <li>* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Unce<br/>Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1</li> </ul> | ed fron<br>alibrate<br>alibrates<br>lances<br>l value,<br>l value,<br>C.E., "Q<br>C.E., "Q<br>C.E., "Q | The certified value is the concentration calculated from gravi<br>Purified acids, 18.2 megohm deionized water, calibrated Class<br>the preparation of all standards.<br>All standard containers are meticulously cleaned prior to use.<br>Standards are prepared gravimetrically using balances that ar<br>Standards are certifed (+/-) 0.5% of the stated value, unless<br>All standards should be stored with caps tight and under app<br>Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin<br>Measurement Result," NIST Technical Note 1297, U.S. Gover | ntratio<br>sionized<br>s.<br>etrically<br>etrically<br>5% of t<br>5% of t<br>B.N. a<br>B.N. a | he conce<br>egohm de<br>standardd<br>s are met<br>d gravim<br>(+/-) 0.<br>e stored<br>: Taylor,<br>NIST Tev | alue is t<br>1 8.2 me<br>n of all :<br>ntainer:<br>orepare<br>certifed<br>bould bu<br>ference<br>ference<br>Result," | The certified value is the concen<br>Purified acids, 18.2 megohm dei<br>the preparation of all standards.<br>All standard containers are meti<br>Standards are prepared gravime<br>Standards are certifed (+/-) 0.5<br>All standards should be stored w<br>Uncertainty Reference: Taylor, E<br>Measurement Result," NIST Tech | * The c<br>* Purifie<br>the purifie<br>* All stand<br>* Stand<br>* All stand<br>Measu |      |
| In P. Ar   |   |  |  |   |  | ġ.   | Homogeneity: No heterogeneity was observed in the preparation of this standard.  | ration of  | n the prepa   | bserved   | eity was ol   | eterogen   | neity: No h   | Homoge  |      |
| Certified by:  |   |  | lyte   | (T) = Target analyte                                    | (T) = T  |  |  |  |   |   | lion:   | cterizat   | Physical Characterization:  | Physic  |      |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $                                  | Se         T           Si         <0.02   | Pr 40.02<br>Re 40.02<br>Rh 40.02<br>Rh 40.02<br>Rb 40.02<br>Sc 40.02<br>Sc 40.02   | <ul> <li>40.02</li> &lt;</ul> | PP A A A A A A A A A A A A A A A A A A                  | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02   | Li<br>Lu<br>Mg<br>Mn<br>Hg<br>Nd   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02  | HH<br>Fr<br>Fr<br>Fr<br>Fr<br>Fr   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02   | Dy<br>Er<br>Eu<br>Ga<br>Ga  | 40.2<br>40.2<br>40.2<br>40.2<br>40.2  | 5 6 <b>6 8 6 6</b> 5   | 40.02<br>40.02<br>40.02<br>40.02<br>40.02<br>40.02  | Al<br>As<br>Ba<br>Bi<br>Bi  |      |
|  |   | (µg/mL)  | ICP-MS   | -MS):<br>on by  | metry (ICP-MS):<br>Verification by ICP-MS  | s Spectrom<br>Metals V   | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):<br>Trace Metals Verification by  | Plasma   | Coupled   | ctively   | by Indu   | nalysis  | nental A  | Instru  |      |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |   | ₽M   | terial Cl  | nce Ma  | Certified Reference Material CRM   | Certifie   |  |  |   |   | Inc.  |  | Absolute Standards,<br>800-368-1131<br>www.absolutestandards.com  | Absolute<br>800-368-1131<br>www.absolute  | 800- |



300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

### Certificate of Analysis M5936, M5933 R: 02/22/24 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:                    | CGMO1                                |  |  |  |  |  |
| Lot Number:                        | T2-M0720876                          |  |  |  |  |  |
| Matrix:                            | H2O                                  |  |  |  |  |  |
|                                    | tr. NH4OH                            |  |  |  |  |  |
| Value / Analyte(s):                | 1 000 μg/mL ea:                      |  |  |  |  |  |
|                                    | Molybdenum                           |  |  |  |  |  |
| Starting Material:                 | Ammonium Molybdate                   |  |  |  |  |  |
| Starting Material Lot#:            | 2361                                 |  |  |  |  |  |
| Starting Material Purity:          | 99.9893%                             |  |  |  |  |  |
| CEDTIEIED VALUES AND UNCEDTAINTIES |                                      |  |  |  |  |  |

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

| <b>Certified Value:</b> | 998 ± 7 μg/mL                      |
|-------------------------|------------------------------------|
| Density:                | 1.000 g/mL (measured at 20 ± 4 °C) |

**Assav Information:** 

| Assay Method #1 | 998 ± 4 µg/mL                              |
|-----------------|--|
|                 | ICP Assay NIST SRM 3134 Lot Number: 130418 |

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

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

| Characterization of CRM/RM by Two or More Methods   | Characterization of CRM/RM by One Method   |
|---|--|
| Certified Value, X <sub>CRWRM</sub> , where two or more methods of characterization are<br>used is the weighted mean of the results:  | Certified Value, X <sub>CRWRM</sub> , where one method of characterization<br>is used is the mean of individual results:   |
| $\begin{split} & \textbf{X}_{CRM/RM} \equiv \boldsymbol{\Sigma}(\textbf{w}_i) \left( \textbf{X}_i \right) \\ & \textbf{X}_i = \text{mean of Assay Method : with standard uncertainty u_{char i} \\ & \textbf{w}_i = \text{the weightling factors for each method calculated using the inverse square of the variance.} \\ & \textbf{w}_i = (1/k_{ohar})^2 / (\boldsymbol{\Sigma}(1/(u_{char}))^2) \end{split}$  | $X_{CRM/RM} = (X_a) (u_{cher, a})$<br>$X_a = mean of Assay Method A withu_{cher, a} = the standard uncertainty of characterization Method A$   |
| CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k ( $u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{cs}$ ) <sup>1/5</sup><br>k = coverage factor = 2<br>$u_{char} = [\Sigma(w_p)^2 (u_{char}; p^2)]^{1/2}$ where $u_{char}$ are the errors from each characterization method<br>$u_{bb} = $ bottle to bottle homogeneity standard uncertainty<br>$u_{lts} = long term stability standard uncertainty (storage) u_{ts} = transport stability standard uncertainty$ | CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char a</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>lts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>y<sub>5</sub></sup><br>k = coverage factor = 2<br>u <sub>char a</sub> = the errors from characterization<br>u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty<br>u <sub>lts</sub> = long term stability standard uncertainty (storage)<br>u <sub>lts</sub> = transport stability standard uncertainty |
| Page 1 of 4   |  |

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

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

### 6.0 INTENDED USE

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

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

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^\circ$  -  $24^\circ$  C to minimize the effects of transpiration. Use at  $20^\circ \pm 4^\circ$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliguots to container.

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

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

**Chemical Compatibility** -Mo is received in a NH4OH matrix giving the operator the option of using HCI or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCI [MoOCI5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-2. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the [MoO4]-2 chemical form.

**Stability -** 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH4OH in a LDPE container.

**Mo Containing Samples (Preparation and Solution)** -Metal (Soluble in HF / HNO3 or hot dilute HCI); Oxide (soluble in HF or NH4OH); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or HCI). Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

| Technique/Line     | Estimated D.L.       | Order | Interferences (underlined indicates severe) |
|--------------------|----------------------|-------|---|
| ICP-MS 95 amu      | 3 ppt                | n/a   | 40Ar39K16O,79Br1                            |
|                    |                      |       | 60,1900s2+,190Pt                            |
|                    |                      |       | 2+  |
| ICP-OES 202.030 nm | 0.008 / 0.0002 µg/mL | 1     | Os, Hf                                      |
| ICP-OES 203.844 nm | 0.012 / 0.002 μg/mL  | 1     |   |
| ICP-OES 204.598 nm | 0.012 / 0.001 µg/mL  | 1     | Ir, Ta                                      |

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### **11.1 Certification Issue Date**

July 17, 2022

- The certification is valid within the measurement uncertainty specified provided the CRW/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 17, 2027

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

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

### **11.3 Period of Validity**

- Sealed TCT Bag Open Date:

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

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

Uyen Truong Supervisor, Product Documentation

Michael 2 Booth

**Certificate Approved By:** 

Michael Booth **Director**, Technical

### **Certifying Officer:**

**Paul Gaines** Chairman / Senior Technical Director

Paul R Laine

| ADSOIUTE STANDARDS, INC.<br>800-368-1131<br>www absolutestandards com      | P          |  |                                       | 0         | ertified R               | eference      | Material CF   |               |                         |              | AR  | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number | ocredited<br>Number |
|--|------------|--|---------------------------------------|-----------|--------------------------|---------------|---------------|---------------|-------------------------|--------------|---|---|---------------------|
|  |            |  | X                                     | 6         | -                        | ž             | K5981 R:61    | 1             | 124                     | 6            | https   | https://Absolutestandards.com                           | ards.com            |
| <b>CERTIFIED WEIGHT REPORT:</b>  |            |  |                                       |           |                          | Lot #         | Solvent:      |               |                         |              |   |   |                     |
| Part Number:<br>Lot Number:  |            | 57092<br>060724                          |                                       |           |                          | 24002546      | Nitric Acid   |               | Phina R                 | 1° man Mr. 9 | ARector   |   |                     |
| Description:   |            | Uranium (U)                              | ົ                                     |           |                          |               |               |               | 252                     |              |   |   |                     |
|  |            |  |                                       |           |                          | 2.0%          | 40.0          | Nitric Acid   | Formulated By:          | 2            | Giovanni Esposito   | 060724  |                     |
| Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): |            | 060727<br>Ambient (20 °C)<br><b>1000</b> | 0 °C)                                 |           |                          |               | (mL)          |               | Jus                     | 42 . A       | enter   |   |                     |
| NIST Test Number:  |            | GUTB                                     |                                       | 5E-05     | Balance Uncertainty      | inty          |               |               | Reviewed By:            |              | Pedro L. Rentas   | 060724  |                     |
| Volume shown below was diluted to (mL):                                    | was dilute | d to (mL):                               | 2000.07                               | 0.100     | Flask Uncertainty        |               |               |               |                         |              |   |   | -                   |
|  | Part       | Lot                                      | Dilution                              | Initial   | Uncertainty              | Nominal       | Initial       | Final         | Expanded<br>Uncertainty | (Solven      | SDS Information<br>(Solvent Safety Info. On Attached pg.) | tion<br>Attached po.)                                   | NIST                |
| Compound   | Number     | Number                                   | Factor                                | Vol. (mL) | Vol. (mL) Pipette (mL) ( | Conc. (µg/mL) | Conc. (ug/mL) | Conc. (µg/mL) | +/- (ug/ml.)            | CAS#         | OSHA PEL (TWA)  | LD50  | SRM                 |
| 1. Uranyl nitrate hexahydrate (U)  | 58192      | 041524                                   | 0.1000                                | 200.0     | 0.084                    | 1000          | 10001.5       | 1000.0        | 2.2                     | 13520-83-7   | 0.05 mg/m3  | orl-rat 1040 mg/kg                                      | 3164                |
| [1] Spectrum No.1  | trum No    | а <u>н</u>                               | 23.254 sec]:57092.D# [Count] [Linear] | 9c]:570   | 092.D#[0                 | ini) [mino    | near]         |               |                         |              |   |   | F                   |
| 1.0E6  |            |  |                                       |           |                          | )<br>1        |               |               |                         |              |   |   |                     |
|  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
| 5.0E8  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
|  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
|  | 10         | 0  | 30                                    |           | 40                       | 50            | 00            | 20            |                         | 80           | 08  | 100   | _                   |
| 5.0E4  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
|  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
| 0.3<br>7<br>4  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
| m/z->  | 0          | 120                                      | 130                                   | 0         | 440                      | 150           | 160           | 021           |                         | 081          | Cer   | 000   |                     |
|  |            |  |                                       |           |                          |               |               |               |                         | 0            |   |   | -                   |
| 9<br>1<br>0  |            |  |                                       |           | 46468                    |               |               |               |                         |              |   |   |                     |
| 6.0E5  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
|  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |
| m/z->  | 810        | 520                                      | 530                                   | 0         | 240                      | 250           | 260           |               |                         |              |   |   |                     |
|  |            |  |                                       |           |                          |               |               |               |                         |              |   |   | ]                   |
| Part # 57092 Lot # 060724  |            |  |                                       |           |                          | 1 of 2        |               |               |                         | Printe       | Printed: 6/7/2024, 3:58:45 PM                             | 8:45 PM   |                     |
|  |            |  |                                       |           |                          |               |               |               |                         |              |   |   |                     |

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





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



| <0.02 Cd <0.02 Dy <0.02 Hf <0.02 Li <0.02   |       | The factor of the second se   |   |                                      |         |              |      |
|---|-------|---|---|--------------------------------------|---------|--------------|------|
| Cd <0.02 Dy <0.02 Hf <0.02 Li   |       | and the second se | A number of state of the state | Statistical and a statistical design | の日本の日本の |              |      |
|   | _     | Ľ   |   | 507                                  | ŧ       |              | AV I |
| Ca <0.2 Er <0.02 Ha <0.02 Ha <0.02 I.a  | Nh    |   |   |                                      | 2 6     | 70.02        | *    |
| بن المراجع (1993)<br>1933 - 1933 - 1933<br>1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 1933 - 193 |       |   |   |                                      | e.      | <b>≤0.02</b> | D    |
|   |       | •   |   | <u>60.0</u> 5                        | Ę       | 20.02        | >    |
| Cs <0.02 Gd <0.02 If <0.02 Mn   |       | _   |   | ŝ                                    | 4       |              |      |
| Cr <0.02 Ga <0.07 Fe <10.7 He   |       |   |   | 707                                  | 111     | 70'05        | QI   |
|   |       |   | _   | <0.02                                | ЦШ      | <u>60.02</u> | ¥    |
| CU 2012 UE 2012 La 2012 Mo  |       |   |   | <0.02                                | Sn      | 000          | 7    |
| Cii <0.02 Au <0.02 Pb <0.02 Nd  | K 402 |   |   |                                      |         |              | 1    |

Physical Characterization:

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

**Certified by:** 

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

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Sulfuric Acid BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis

Low Selenium

W form - Np





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 (NH4)                                  | ≤ 1 ppm       | 1 ppm       |
| Chloride (Cl)                                   | ≤ 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



C10 30C 1300

Jamie Ethier Vice President Global Quality

1.0



### Certificate of Analysis

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

| Product Code:       | Multi Analyte Custom Grade Solution |            |
|---------------------|-------------------------------------|------------|
| Catalog Number:     | IV-STOCK-12                         |            |
| Lot Number:         | U2-MEB734294                        |            |
| Matrix:             | 5% (v/v) HNO3                       |            |
| Value / Analyte(s): | 10 μg/mL ea:                        |            |
|                     | Barium,                             | Beryllium, |
|                     | Bismuth,                            | Cerium,    |
|                     | Cobalt,                             | Indium,    |
|                     | Lithium,                            | Nickel,    |
|                     | Lead,                               | Uranium    |

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

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

**Assay Information:** 

| ANALYTE | METHOD      | NIST SRM#         | SRM LOT#     |
|---------|-------------|-------------------|--------------|
| Ва      | ICP Assay   | 3104a             | 140909       |
| Ва      | Calculated  |                   | See Sec. 4.2 |
| Ва      | Gravimetric |                   | See Sec. 4.2 |
| Be      | ICP Assay   | 3105a             | 090514       |
| Be      | Calculated  |                   | See Sec. 4.2 |
| Bi      | ICP Assay   | 3106              | 180815       |
| Ce      | ICP Assay   | 3110              | 160830       |
| Ce      | EDTA        | 928               | 928          |
| Ce      | Calculated  |                   | See Sec. 4.2 |
| Co      | ICP Assay   | 3113              | 190630       |
| Co      | EDTA        | 928               | 928          |
| Co      | Calculated  |                   | See Sec. 4.2 |
| In      | ICP Assay   | 3124a             | 110516       |
| In      | EDTA        | 928               | 928          |
| In      | Calculated  |                   | See Sec. 4.2 |
| Li      | ICP Assay   | 3129a             | 100714       |
| Lí      | Calculated  |                   | See Sec. 4.2 |
| Li      | Gravimetric |                   | See Sec. 4.2 |
| Ni      | ICP Assay   | 3136              | 120619       |
| Ni      | EDTA        | 928               | 928          |
| Ni      | Calculated  |                   | See Sec. 4.2 |
| Pb      | ICP Assay   | 3128              | 101026       |
| Pb      | EDTA        | 928               | 928          |
| Pb      | Calculated  |                   | See Sec. 4.2 |
| U       | ICP Assay   | traceable to 3164 | R2-U689597   |
| U       | Calculated  |                   | See Sec. 4.2 |
|         |             |                   |              |

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

| Characterization of CRM/RM by Two or More Methods   | Characterization of CRM/RM by One Method   |
|---|--|
| Certified Value, X <sub>CRWRM</sub> , where two or more methods of characterization are<br>used is the weighted mean of the results:                    | Certified Value, X <sub>CRWRM</sub> , where one method of characterization<br>is used is the mean of individual results:   |
| $\mathbf{x}_{\mathbf{CRM/RM}} = \Sigma(\mathbf{w}_i) (\mathbf{x}_i)$  | $X_{CRM/RM} = (X_{a}) (u_{char a})$  |
| X <sub>i</sub> = mean of Assay Method I with standard uncertainty u <sub>char i</sub>   | X <sub>a</sub> = mean of Assay Method A with   |
| $w_j$ = the weighting factors for each method calculated using the inverse square of the variance:<br>$w_i = (1/u_{char})^2 / (\Sigma(1/(u_{char})^2))$ | $\boldsymbol{u}_{char,a}$ = the standard uncertainty of characterization Method A  |
| CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$   | CRM/RM Expanded Uncertainty (1) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char a</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>fts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>%</sup> |
| k = coverage factor = 2   | k = coverage factor = 2  |
| $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{\frac{1}{2}}$ where $u_{char}$ are the errors from each characterization method                             | uchar a = the errors from characterization   |
| ubb = bottle to bottle homogeneity standard uncertainty   | ubb = bottle to bottle homogeneity standard uncertainty  |
| u <sub>lts</sub> = long term stability standard uncertainty (storage)   | ults = long term stability standard uncertainty (storage)  |
| uts = transport stability standard uncertainty  | uts = transport stability standard uncertainty   |
| Certified Abundance:  |  |
| IV's Certified Abundance  |  |

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/A

### 6.0 INTENDED USE

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

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures Terms and Conditions of Sale. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. 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° C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### **11.1 Certification Issue Date**

June 21, 2023

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

### **11.2 Lot Expiration Date**

- June 21, 2028
- The date after which this CRM/RM should not be used.

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

### **11.3 Period of Validity**

- Sealed TCT Bag Open Date:

- 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 Approved By:** 

Thomas Kozikowski Manager, Quality Control

SD9781. Paul R Saine

### **Certifying Officer:**

**Paul Gaines** Chairman / Senior Technical Director

| Part # 57040 Lot # 071423       | m/≚-≫ 210 220 | 5.0E7 | m/z-≫ 110 120<br>1.0E8 | <sup>5.</sup> 0∈7 | m/≂-≫ 10 20<br>1.0E8 | ប.<br>ញ | [1] Spectrum No.1<br>1.0E6            | 1. Zirconyl chloride octahydrate (Zr) 58140 070621 | Part Lot<br>Compound Number Number   | 800-368-1131<br>www.absolutestandards.com<br>CERTIFIED WEIGHT REPORT:<br>Part Number: 57040<br>Lot Number: 071423<br>Description: Zirconium (Zr<br>Sinconium (Zr<br>Concentration (µg/mL): 011426<br>Recommended Storage: Ambient (20 °C)<br>NIST Test Number: 6UTB<br>Volume shown below was diluted to (mL): 21 |
|---------------------------------|---------------|-------|------------------------|-------------------|----------------------|---------|---------------------------------------|--|--|---|
|                                 | 230           |       | 190                    |                   | 30                   |         | [ 41.153 ago                          | 0.1000   | Dilution   | n (Zr)<br>2000.02   |
|                                 | N<br>40       |       | 140                    |                   | 4                    |         | 41.153 %ec]:57040.D% [Count] [Linear] | 200.0 0.084  | Initial Uncertainty<br>Vol. (ml.) Pipette (mL) (                                   | Certified Refere  |
| 1 of 2                          | N 50          |       | 160                    |                   | a<br>O               |         | Count] [Line                          | 1000 10  | Nominal I<br>Conc. (µg/mL) Conc  | Lot #<br>21110221<br>2.0%   |
|                                 | N 00<br>O     |       | 160                    |                   | 0                    |         | 8<br>]                                | 10000.3 1000.0                                     | Initial Final<br>Conc. (µg/mL) Conc. (µg/mL)                                       | A CRM<br>Solvent:<br>Nitric Acid<br>40.0 Nitric Acid<br>(mL)  |
|                                 |               |       | 170                    |                   | 70                   |         |                                       | 0 2.2  | Expanded<br>Uncertainty<br>'mL) +/- (µg/mL)  | d 24<br>Formulated By:<br>Reviewed By:  |
| Printed:                        |               |       | 180 1                  |                   | 0<br>O               |         |                                       | 13520-92-8   | (Solvent :<br>CAS# OS  |   |
| Printed: 9/27/2024, 10:15:02 AM |               |       | 190 200                |                   | 9<br>C<br>100        |         |                                       | NA   | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD50 | AR-15<br>AR-15<br>https://Al<br>Benson Chan<br>Pedro L. Rentas  |
| ;:02 AM                         |               |       | U                      |                   | U                    |         |                                       | NA   |  | ANAB ISO 1/034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com  |
|                                 |               |       |                        |                   |                      |         |                                       | NA   | SRM  | rds.com   |

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



**Certified Reference Material CRM** 



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

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

|  |              | ¢.     | 1     | <u></u> | DC                                      | 5   | Ва    |              | As      | 30    | 2     | AI   |  |             |           |
|--|--------------|--------|-------|---------|---|---|-------|--------------|---------|-------|-------|--|--|-------------|-----------|
|  |              | 40.02  |       | 3       | 10:05                                   | 2   | <0.02 | ł            | a,      | <0.02 | 2     | 40.02  |  |             |           |
|  |              | 6<br>C | 8     | 3       | ភ្                                      |   | S     | Ş            | <u></u> | ្ឋ    | 1     | 8  |  |             |           |
|  |              | A).02  | 10.01 | 3       | 40.02                                   |   | 40.02 | 20.02        | 3       | 012   |       | 40.02  |  |             |           |
|  |              | Au     | g     | ?       | ត្ត                                     | ŝ   | 5     | þ            | Ħ       | 막     | 3     | Dv   |  |             |           |
|  | Annu         | <0.03  | 20.02 |         | 40.02                                   | 10.02   | 33    | 20.02        | 2       | <0.02 | 10.02 | co os  | Intel Into Content to Anti-  |             |           |
|  |              | ş      | La    | •       | aj                                      | 2   | ę,    | 5            | • [     | Ho    | ***   | 1HF  | and the second second  |             |           |
|  | 20.00        | 3      | 20.02 | i       | A) )                                    | 20.02   | 3     | <0.02        | -0.02   | 4000  | 70.02 | 2<br>mm  | 「日本になる」  |             | Trace Me  |
|  | Ma           | N      | Mo    | 911     | Ę                                       | MIN   | 1     | Mg           | 144     | 1     | Ē     |  | TOTAL PLANE  |             |           |
| /Th - Tamat analida                      | 20.05        | 3      | A0.02 | 10.2    | 5                                       | <0.02   |       | <u>A0.01</u> | 10.02   | 3     | 20.02 | 2000   | Contraction of the local distance of the loc |             | Varificat |
| at analis                                | ~            | 4      | ¥     | 7       | 9                                       | Pd  | ! !   | ò            | ONT     | Ş     | N     |  | and the second s |             |           |
| 5  | <b>4</b> 0;2 |        | 40.02 | 20.05   | 5                                       | 20.02   |       | 403          | 20.05   | 3     | 40.02 |  | THOSE IN A MICH.   | Y ICI -IVIO | V ICD-MC  |
|  | Sc           |        | ŝ     | NA.     | ,                                       | R   | 2     | HR<br>H      | Ke      | ,     | 7     |  |  | F.S.        | lin       |
|  | <0.02        | 10.02  | 30    | <0.02   |   | <b>40.02</b>  | 10.02 | 300          | 20.02   | 2     | <0.02 |  | CONTRACTOR NO.   |             | -         |
|  | Ta           | č      | ^     | 4       | ,                                       | Na  | 2     | 2            | ŝ       | 2     | Se    |  |  |             |           |
|  | <0.02        | 20.02  | 3     | <0.02   |   | 4012  | 20.02 | 3            | <0.02   |       | <0.2  |  |  |             |           |
|  | П            | , inc  | 2     | Tm      | ;                                       | -   | 11    | 3            | Te      |       | 17    | Contraction of the local distribution of the |  |             |           |
|  | <0.02        | 20.02  | 5     | <0.02   | and | <n n3<="" td=""><td>20.02</td><td>2</td><td>&lt;0,02</td><td>10,04</td><td>con</td><td>10100 10141 - 11 10100 10100</td><td></td><td></td><td></td></n> | 20.02 | 2            | <0,02   | 10,04 | con   | 10100 10141 - 11 10100 10100   |  |             |           |
| 10 10 10 10 10 10 10 10 10 10 10 10 10 1 | Zr           | 20     | J     | ×       |   | Ş   | <     |              | d       | **    | W     | No. of Concession  |  |             |           |
|  | H            | 20.02  | 3     | -0.02   | 20.04                                   | 3   | <0.02 |              | 40.02   | 70.02 | 3     | No. of the local distribution of the local d |  |             |           |

(1) = larget analyte

### Physical Characterization:

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

**Certified by:** 

5

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

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

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com<br>CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Description:<br>Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number: | Setting     Certified Reference Material CRM       Setting     National       112124     N.S. I/I/3/250/vent:     24012496       Magnesium (Mg)     N.S. I/I/3/250/vent:     24012496     Nitric Acid       112127     N.G. V.Y.     2%     40.0     Nitric Acid       112127     M.G.V.Y.     2%     40.0     Nitric Acid       112127     M.G.V.Y.     2%     40.0     Nitric Acid       110000     M.S. Steros Uncertainty     SE-05     Balance Uncertainty | Formulated By:   |
|---|---|--|
| Weight shown below was diluted to (mL):   | 2000.07 0.100 Fask Uncertainty<br>2000.07 0.100 Fask Uncertainty<br>Nominal Purthy Uncertainty Assay Target Actual<br>Conc. (ug/mL) (%) Purthy (%) (%) Weight (g)   | Expanded     SDS Information       Actual     Uncertainty       Uncertainty     (Solvent Safety Info. On Attached pg.)       Conc. (ug/mL)     +/- (ug/mL)       CAS#     OSHA PEL (TWA) |
| 1. Magnesium nitrate hexahydrate (Mg) IN030 Mgposzoza41   | 10000 98.999 0.10 8.51 234.9183 234.9459  | 20.0 13446-18-9 NA orf-rat   |
| [1] Spectrum No.1<br>1.0E6  | [ 19.923 sec];58112.D# [Count] [Linear]   |  |
| g.<br>Oeg   |   |  |
| m/≈-> 10<br>2000  | 20 30 40 50 <b>6</b> 0  | 70 80 90 100   |
| 1000  |   |  |
| m/z-> 110<br>2.0厘4  | 120 130 140 150 160   | 170 180 190 200  |
| m/z-≫ 210   | 220 230 240 250 260   |  |
|   |   |  |

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**Certified Reference Material CRM** 



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

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

| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  |     | -   | 20.02 |     | 20.05 | 18  | <0.0Z | ×   | 40.2  | ĸ  | <0.02 | Nd | <0.02 | Рb  | <0.02 | Au       | <0.02 | ç              | <0.02 | 8          |
|--|--|-----|-----|-------|-----|-------|-----|-------|-----|-------|----|-------|----|-------|-----|-------|----------|-------|----------------|-------|------------|
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  | λ.  | 21  | 2002  | 9 8 | 0.02  | 3 6 | 10.02 | 311 | 20.02 | 2  | <0.02 | MO | 20.02 | 5   | Z0102 | ନ୍ନ      | <0.02 | S              | <0.02 | <u>B</u> . |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 4   | Zn  | -0.02 | 2   | 2002  | 0   | 5     | 2   | 3     | 2  | 3     |    | 200   | 1 ( |       |          | 10.02 | 1              | 10.01 | Ş          |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 6   | Y   | <0.02 | Tm  | <0.02 | S   | <0.02 | Ru  | <0.02 | ŋ  | 40,2  | Hø | 40.2  | 21  | 40.02 | <u>.</u> | AD 03 | 2              | 100   | 5          |
| 40.02         Cd         40.02         Dy         40.02         Hf         40.02         Li         40.02         Ni         40.02         Pr         40.02         Se         40.2         Th         40.02         W           40.02         Ca         40.2         Er         40.02         Hf         40.02         Li         40.02         Pr         40.02         Se         40.2         Th         40.02         W           40.02         Ca         40.2         Er         40.02         Ha         40.02         Nb         40.02         Re         40.02         Si         40.02         T         40.02         V         40.02         V | 40.02       Cd       40.02       Dy       40.02       Hf       40.02       Li       40.02       Ni       40.02       Pr       40.02       Se       40.2       Tb       40.02       W         40.02       Ca       40.2       Er       40.02       Hf       40.02       Li       40.02       N       40.02       Se       40.2       Tb       40.02       U         40.02       Ca       40.02       Hr       40.02       Li       40.02       Nb       40.02       Se       40.2       Tb       40.02       U         40.02       Ca       40.02       Hr       40.02       Mg       T       0s       40.02       Rb       40.02       Tb       40.02       U         40.02       Ca       40.02       In       40.02       Mg       T       0s       40.02       Rb       40.02       Tb       40.02       V         40.02       Ca       40.02       In       40.02       Mg       T       0s       40.02       Rb       40.02       Tb       40.02       V         40.02       Fin       40.02       Mg       T       0s       40.02       Rb       40.02 | . 6 | IO  | 20.02 | 10  | 40.2  | Næ  | <0.02 | Rb  | <0.02 | Pd | <0.02 | Mn | <0.02 | ŀ   | <0.02 | R        | <0.02 | S              | <0.02 | Ba         |
| Cd           CD         Li  <  | 40.02       Cd       40.02       Dy       40.02       Hf       40.02       Li       40.02       Ni       40.02       Pr       40.02       Se       40.2       Tb       40.02       W         40.02       Ca       40.2       Er       40.02       Hf       40.02       Li       40.02       Nb       40.02       Se       40.2       Tb       40.02       U         40.02       Ca       40.02       Ho       40.02       Lu       40.02       Nb       40.02       Si       40.02       Tc       40.02       U  | 56  | ģ < | 20.02 |     | 20.02 | Ag  | <0.02 | Rb  | <0.02 | 0s | Ţ     | Mg | <0.02 | In  | <0.02 | 臣        | <0.02 | ŝ              | <0.2  | As         |
|  | <th< td=""><td>3 6</td><td>4 0</td><td>20.02</td><td>1</td><td>20.02</td><td>2</td><td>20.02</td><td>KC</td><td>&lt;0.02</td><td>NP</td><td>&lt;0.02</td><td>La</td><td>&lt;0.02</td><td>Но</td><td>&lt;0.02</td><td>막</td><td>40.2</td><td>C<sub>2</sub></td><td>&lt;0.02</td><td>SP</td></th<>   | 3 6 | 4 0 | 20.02 | 1   | 20.02 | 2   | 20.02 | KC  | <0.02 | NP | <0.02 | La | <0.02 | Но  | <0.02 | 막        | 40.2  | C <sub>2</sub> | <0.02 | SP         |
|  |  | 3   | ; : | 3     | 3 3 | 5     | a g | 10.02 | 1   | 0.02  | 1  | <0.02 | F  | 20.02 | HI  | 20.02 | Ŋ        | <0.02 | 2              | <0.02 | A          |
|  |  | 4   | W   | 40.02 | 7   | c (b) | S   | 300   | Dr  | 3     |    | 2003  | 1  | 200   |     |       |          |       |                |       |            |

(I) = larget analyte

## Physical Characterization:

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

Son P. A.

Certified by:

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

\* All standard containers are meticulously cleaned prior to use. 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 # 58112 Lot # 112124

| Dat # 60036 101 #              | m/z->-      | 5.067 | m/z-><br>1.0⋿8 | 5.067 | m/≥-><br>1.0E8 | N.5<br>8 | 5.006                                   | 1. Manganese(II) nitrate hydrate (Mn) | Weight sh<br>Compound   | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number: | CERTIFIED WEIGHT REPORT:<br>Part I<br>Lot<br>Des   | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|--------------------------------|-------------|-------|----------------|-------|----------------|----------|---|---------------------------------------|---|---|--|--|
| Lot # 101124                   | Ņ           |       | 110            |       | 10             |          | [1] Spectrum No.1                       |                                       | Weight shown below was diluted to (mL):<br>Lot<br>RM# Number                        | Expiration Date:<br>Recommended Storage:<br>Il Concentration (µg/mL):<br>NIST Test Number:      | <u>Part Number:</u><br>Lot Number:<br>Description: | <b>s, Inc.</b>   |
|                                | N<br>N<br>O |       | 120            |       | 0<br>0         |          |   | A1                                    |   | õ   | 58025<br>101124<br>Manganese (Mn)                  |  |
|                                | N.<br>0     |       | 100            |       | ۵<br>Ö         |          | [ 34.243 sec]:57025.D# [Count] [Linear] | 1000 99.999                           | 4000.2 0.10 Fit<br>Nominal Purity U<br>Cone. (ug/mL) (%) F                          | Ś   | R-71/13/2& Solvent:                                | Се   |
| _                              | N<br>4<br>0 |       | 140            |       | 4<br>0         |          | 25.D# [Count]                           | 0.10 20.8                             | 0.10 Flask Uncertainty<br>Purity Uncertainty Assay<br>(%) Purity (%) (%)            | SE-05 Balance Uncertainty   |  | rtified Referen  |
| 1 of 2                         | 260<br>260  |       | 150 160        |       | 0.<br>0.       |          | [Linear]                                |                                       | Target Actual<br>Weight (g) Weight (g)  | (mL) Nitric Acid  | 46   | Certified Reference Material CRM   |
|                                |             |       | 170            |       | 70             |          |   |                                       | Actual<br>Conc. (ug/mL)   | (   |  | M  |
| Prin                           |             |       | 180            |       | 8              |          |   | <b>2.0</b> 15710-66-4                 | Expanded<br>Uncertainty (SolVe<br>+/- (µg/mL) CAS#                                  | Pormulated by:  | Giovannie  |  |
| Printed: 1/10/2025, 4:51:16 PM |             |       | 190            |       | 80             |          |   | 5 mg/m3                               | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br>S# OSHA PEL (TWA) LD50 | Pedro L. Rentas   | Especite   | ANA<br>AR-<br>https:   |
| :51:16 PM                      |             |       | N<br>0<br>0    |       | 100            |          |   | orl-rat >300mg/kg                     | ttion<br>Attached pg.)<br>LD50  | 101124  |  | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|                                |             |       |                |       |                |          |   | g 3132                                | NIST  | <u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>   |  | Accredited<br>e Number<br>Jards.com  |

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





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

| Г  |       |    |       |     |       |    | Trace Mo | etals | Verifica | ition | by ICP- | Ś   | (µg/mL) |    |       |    |       |                |       |
|----|-------|----|-------|-----|-------|----|----------|-------|----------|-------|---------|-----|---------|----|-------|----|-------|----------------|-------|
|    | 3     | 2  | 2000  |     | 200   |    | 200      |       |          |       |         |     |         |    |       |    |       |                |       |
| Al | <0.02 | 8  | <0.02 | Ðy  | <0.02 | Hf | <0.02    | 5     | <0.02    | N     | <0.02   | Ŗ   | <0.02   | Se | 40.2  | ТЪ | <0.02 | W              | <0.02 |
| Sb | <0.02 | Q  | <0.2  | Ę   | <0.02 | Ho | <0.02    | Ę     | <0.02    | N     | <0.02   | Re  | <0.02   | S  | <0.02 | Te | <0.02 | C              | <0.02 |
| As | <0.2  | ଚ  | <0.02 | Eu  | <0.02 | In | <0.02    | Mg    | <0.01    | °s    | <0.02   | RJ. | <0.02   | Ag | <0.02 | Ξ  | <0.02 | <              | <0.02 |
| Ba | <0.02 | Ç  | <0.02 | ଜୁ  | <0.02 | F, | <0.02    | Mn    | Н        | Pd    | <0.02   | Rb  | <0.02   | Na | <0.2  | П  | <0.02 | Υ <sub>b</sub> | <0.02 |
| Be | <0.01 | ភ្ | <0.02 | ဌ   | <0.02 | Fe | <0.2     | Hg    | <0.2     | Ψ     | <0.02   | Ru  | <0.02   | Sr | <0.02 | Tm | <0.02 | ×              | <0.02 |
| Bi | <0.02 | S  | <0.02 | ନ୍ଚ | <0.02 | La | <0.02    | Mo    | <0.02    | P     | <0.02   | Sm  | <0.02   | s  | <0.02 | Sn | <0.02 | Zn             | <0.02 |
| в  | <0.02 | Q  | <0.02 | Au  | <0.02 | РЬ | <0.02    | Nd    | <0.02    | ĸ     | <0.2    | Sc  | <0.02   | Ta | <0.02 | E  | <0.02 | Zr             | <0.02 |
|    |       |    |       |     |       |    |          |       |          |       |         |     |         |    |       |    |       |                |       |

(T) = Target analyte

## **Physical Characterization:**

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

for P. S.

**Certified by:** 

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

\* Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in

the preparation of all standards.

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

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

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

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

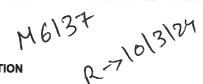
\* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58025 Lot # 101124



### **Certificate of Analysis**

300 Technology Drive Christiansburg, VA 24073 USA 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).

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



### 2.0 **PRODUCT DESCRIPTION**

| Product Code:             | Single Analyte Custom Grade Solution   |
|---------------------------|--|
| Catalog Number:           | CGSI1                                  |
| Lot Number:               | V2-SI744713                            |
| Matrix:                   | tr. HNO3<br>tr. HF                     |
| Value / Analyte(s):       | 1 000 μg/mL ea:<br>Silicon             |
| Starting Material:        | Silica                                 |
| Starting Material Lot#:   | 1771                                   |
| Starting Material Purity: | 99.9981%                               |
| CERTIFIED VALUES AN       | D UNCERTAINTIES                        |
| Certified Value:          | 999 ± 6 µg/mL                          |
| Density:                  | 1.003 g/mL (measured at 20 $\pm$ 4 °C) |

**Assay Information:** 

3.0

| Assay Method #1 | <b>999 ± 5 μg/mL</b><br>ICP Assay NIST SRM Traceable to 3150 Lot Number: S2-SI702546 |
|-----------------|--|
| Assay Method #2 | 1000 ± 7 μg/mL   |

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

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

 $X_i = mean of Assay Method i with standard uncertainty <math>v_{char} i$  $w_i = the weighting factors for each method calculated using the inverse square of$ the variance:

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

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k (u<sup>2</sup><sub>char</sub> + u<sup>2</sup><sub>bb</sub> + u<sup>2</sup><sub>15</sub> + u<sup>2</sup><sub>15</sub>)<sup>1/2</sup> k = coverage factor = 2 u<sub>char</sub> = [2((w<sub>i</sub>)<sup>2</sup> (u<sub>char</sub>)<sup>2</sup>)]<sup>1/2</sup> where u<sub>char</sub> is the errors from each characterization method u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

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

### Characterization of CRM/RM by One Method Certified Value, X<sub>CRMRM</sub>, where one method of characterization

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

 $\begin{array}{l} X_{CRM/RM} = (X_{a}) \, (u_{char\ a}) \\ X_{a} = mean\ of Assay\ Method\ A\ with \\ u_{char\ a} = the\ standard\ uncertainty\ of\ characterization\ Method\ A \end{array}$ 

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k  $(u^2_{chara} + u^2_{bb} + u^2_{its} + u^2_{ts})^{Y_b}$ k = coverage factor = 2  $u_{chara} =$ <sup>th</sup>e errors from characterization  $u_{bb} =$  bottle to bottle homogeneity standard uncertainty  $u_{its} =$  long term stability standard uncertainty (storage)  $u_{its} =$  tansport 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 | < | 0.000310 | М | Eu | < | 0.000310 | 0 | Na |   | 0.001656 | М   | Se | < | 0.022000 | М | Zn | < | 0.002500 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|-----|----|---|----------|---|----|---|----------|
| М | Al |   | 0.010787 | М | Fe | < | 0.027000 | М | Nb | < | 0.001300 | s   | Si | < |          | 0 | Zr | < | 0.001900 |
| М | As | < | 0.001900 | М | Ga | < | 0.001300 | М | Nd | < | 0.000310 | м   | Sm | < | 0.000310 |   |    |   |          |
| M | Au | < | 0.000910 | М | Gd | < | 0.000310 | Μ | Ni | < | 0.005500 | м   | Sn |   | 0.000096 |   |    |   |          |
| M | в  |   | 0.016180 | М | Ge | < | 0.001900 | М | Os | < | 0.000610 | 0   | Sr |   | 0.000092 |   |    |   |          |
| Μ | Ba |   | 0.000096 | М | Hf |   | 0.000423 | i | Р  | < |          | M   | Та |   | 0.002542 |   |    |   |          |
| 0 | Be | < | 0.000570 | М | Hg | < | 0.000610 | М | Pb | < | 0.000310 |     |    | < | 0.000310 |   |    |   |          |
| М | Bi | < | 0.000310 | М | Но | < | 0.000610 | м | Pd | < | 0.000610 |     | _  | < | 0.000910 |   |    |   |          |
| 0 | Са |   | 0.011557 | М | in | < | 0.000310 | М | Pr | < | 0.000310 |     |    | < | 0.001900 |   |    |   |          |
| М | Cď | < | 0.000310 | M | lr | < | 0.000310 | м |    | < | 0.000310 |     | П  | - | 0.001078 |   |    |   |          |
| М | Се | < | 0.000610 | 0 | ĸ  |   | 0.000577 |   | Rb |   | 0.009100 |     |    | < | 0.000310 |   |    |   |          |
| М | Co | < | 0.001600 | M | La | < | 0.000310 |   | Re |   | 0.000310 |     | Tm |   |          |   |    |   |          |
| М | Cr | < | 0.010000 |   | Li | < | 0.000460 |   | Rh |   |          |     |    |   | 0.000310 |   |    |   |          |
|   |    |   |          | - |    |   |          |   |    |   | 0.000310 | IVI | U  | < | 0.000310 |   |    |   |          |
| M | 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 | Dy | < | 0.000310 | М | Mn | < | 0.002500 | М | Sb | < | 0.000310 | М   | Y  | < | 0.000310 |   |    |   |          |
| М | Er | < | 0.000310 | М | 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>, <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. 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°  $\pm$  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 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 except HF.

**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.

| 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                          |

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

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

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

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

### **11.1 Certification Issue Date**

July 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**

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.

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

Uyen Truong Custom Processing Supervisor

Mayn Mung Mayni Kh Paul R Laine

### **Certificate Approved By:**

Muzzammil Khan Stock Laboratory Supervisor

### **Certifying Officer:**

**Paul Gaines** Chairman / Senior Technical Director

Page 4 of 4

| m/z->  | \$<br>000 | m/z-≻<br>1.0E4 | -1<br>.0<br>M<br>03 | m/z-><br>2.0E5 | 1.0E8 | 2.000                                 | 1. Potassium nitrate (K) | Compound  | NIST Te<br>Weight show  | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL): | <u>CERTIFIED WEIGHT REPORT:</u><br>Part<br>Lot<br>De                        | 800-368-1131<br>www.absolutestandards.com  |
|--------|-----------|----------------|---------------------|----------------|-------|---------------------------------------|--------------------------|---|---|--|---|--|
| N<br>0 |           | 110            |                     | <b>1</b><br>0  |       | [1] Spectrum No.1                     | IN034                    | RM#   | NIST Test Number: 6UTB<br>Weight shown below was diluted to (mL): | Expiration Date:<br>nended Storage:<br>ntration (µg/mL):                   | ORT:<br>Part Number:<br>Lot Number:<br>Description:                         | 3 3  |
|        |           | 120            |                     | 20             |       | -                                     | IN034 KD062022A1         | Lat   |   | 103027<br>Ambient (20 °C)<br><b>10000</b>                                  | <u>57119</u><br><u>103024</u><br>Potassium (†                               |  |
|        |           | 1<br>0<br>0    |                     | a              |       | 35.763 sec]:58119.D# [Count] [Linear] | 10000 99.999             | Nominal Purity<br>Conc. (µg/mL) (%)   | 5E-05<br>4000.1 0.15  | M6143  | $\frac{57119}{103024} R \rightarrow 1/13/2.5$ $\frac{103024}{1043} M 61/11$ |  |
|        |           | 1.<br>0        |                     | 40             |       | 8119.D# [C                            | 0.10 37.7                | Uncertainty Assay<br>Purity (%) (%)   | 5E-05 Balance Uncertainty<br>0.15 Flask Uncertainty               |  | Solvent:  | Certified Re   |
|        |           | 150            |                     | 07.<br>O       |       | ount] [Lines                          | 106.1040                 | y Target<br>Weight (g)  |   |  | Lot #<br>t: 24002546  | Certified Reference Material CRM   |
|        |           | 10-<br>0       |                     | 0              |       | 'n                                    | ##### 100                | Actual Act<br>Weight (g) Conc.  |   |  | Nitric Acid   | erial CRM  |
|        |           | 170            |                     | 0              |       |                                       | 10001.1 20.0             | Expanded<br>Actual Uncertainty<br>Conc. (µg/mL) +/- (µg/mL)                 | Reviewed By:  | X  | Hierat  |  |
|        |           | 180            |                     | 80             |       |                                       | 7757-79-1                | CAS#  |   | \$   | Vie.  |  |
|        |           | 061            |                     | 80             |       |                                       | 5 mg/m3                  | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br>OSHA PEL (TWA) | Pedro L. Rentas   | tento  | Capestite<br>Giovanni Esposito  | http   |
|        |           | 200            |                     | 100            |       |                                       | orl-rat 3750 mg/kg 3141a | n Attached pg.)<br>A) LD50  | 103024  |  | 103024  | AIVAD ISO 17034 Accreated<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |
|        |           |                |                     |                |       |                                       | vkg 3141a                | NIST  | 124   |  | 24  | 4 Accredit<br>ate Numb<br>ndards.cc  |

Part # 57119 Lot # 103024

1 of 2

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



**Certified Reference Material CRM** 



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

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

|    |       |    |       |     |       |    | Trace Me | etals | Verifica | ition | by ICP- | MS ( | (Jug/mL) |    |       |    |       |     |       |
|----|-------|----|-------|-----|-------|----|----------|-------|----------|-------|---------|------|----------|----|-------|----|-------|-----|-------|
| A  | <0.02 | Cd | <0.02 | Dy  | <0.02 | Hf | <0.02    | 5     | <0.02    | Ni    | <0.02   | 7    | <0.02    | Se | A0.2  | Тb | 40.02 | W   | 40.02 |
| SP | <0.02 | ß  | A0 2  | 말.  | <0.02 | Но | <0.02    | L     | <0.02    | ß     | <0.02   | Re   | <0.02    | ŝ  | <0.02 | Te | <0.02 | e   | <0.02 |
| As | <0.2  | ĉ  | <0.02 | 臣   | <0.02 | ľ  | <0.02    | Mg    | <0.01    | õ     | <0.02   | Rß   | <0.02    | Ag | <0.02 | Ξ  | <0.02 | <   | <0.02 |
| Ba | <0.02 | ŝ  | <0.02 | ଜ   | <0.02 | ŀ  | <0.02    | Mn    | <0.02    | Pd    | <0.02   | Rb   | <0.02    | Na | 40.2  | ТЪ | <0.02 | Ϋ́b | <0.02 |
| Be | <0.01 | ç  | <0.02 | ဌာ  | <0.02 | Fe | <02      | Hg    | <0.2     | P     | <0.02   | Ru   | <0.02    | ST | <0.02 | Im | <0.02 | Y   | <0.02 |
| Bi | <0.02 | S  | <0.02 | ନ୍ଚ | <0.02 | 5  | <0.02    | Mo    | <0.02    | Ŗ     | <0.02   | Sm   | <0.02    | s  | <0.02 | Sn | <0.02 | Zn  | <0.02 |
| B  | <0.02 | 0° | <0.02 | Au  | <0.02 | РЪ | <0.02    | Nd    | <0.02    | K     | Т       | Sc   | <0.02    | Ta | <0.02 | Ti | <0.02 | Zr  | <0.02 |
|    |       |    |       |     |       |    |          |       | 3        |       |         |      |          |    |       |    |       |     |       |

(I) = Target analyte

## Physical Characterization:

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

In & All

Certified by:

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

\* All standard containers are meticulously cleaned prior to use. 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 # 57119 Lot # 103024

| Part # 58111 Lot # 072424      | m/z->   | თ<br>მ | m/z->           | א.<br>ה<br>ס |              | N<br>51<br>11<br>63 | 5.0E5                                | 1. Sodium nitrate (Na)     | Compound   | Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number:<br>Welght shown below wa | CERTIFIED WEIGHT REPORT:<br>Part Number:<br>Lot Number:<br>Description:               | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    |
|--------------------------------|---------|--------|-----------------|--------------|--------------|---------------------|--------------------------------------|----------------------------|--|--|---|--|
| 424                            | 210 220 |        | 110 120         |              | ว<br>ง<br>ง  |                     | [1] Spectrum No.1                    | IN036 NAV01201511 1        | RM# Lot N  | 072427<br>Ambient (20 °<br><b>10000</b><br>6UTB<br><b>s diluted to (mL):</b>   | N <u>RT:</u><br>nber: <u>58111</u><br>nber: <u>072424</u><br>tion: <u>Sodium (Na)</u> | Inc.   |
|                                | 230     |        | 130 140         |              | 30<br>40     |                     | 8.935 sec]:58111.D# [Count] [Linear] | 10000 99.999 0.10 26.9     | Nominal Purity Uncertainty Assay<br>Conc. (ug/mL) (%) Purity (%) (%)   | C)<br>5E-05 Balance Uncertainty<br>4000.2 0.10 Flask Uncertainty   | Solv  | Certified Re   |
| 1 of 2                         | 250 260 |        | 150 160 1       |              | 50<br>60     |                     | unt] [Linear]                        | 148.7096 ###### 10000.0    | Target Actual Actual<br>Weight (g) Weight (g) Conc. (µg/mL)  | 80.0 Nitric Acid<br>(mL)   | Lot #<br>24002546 Nitric Acid   | Certified Reference Material CRM   |
| Printed: 1/10/2025, 4:48:22 PM |         |        | 170 180 190 200 |              | 70 80 90 100 |                     |                                      | 20.0 7631-99-4 5 mg/m3 orl | Expanded SDS Information<br>Uncertainty (Solvent Safety Info. On Attached pg.)<br>) +/- (µg/mL) CAS# OSHA PEL (TWA) LDSO | ad By:<br>By:<br>Ped   |   | ANAB I<br>AR-15:<br>https://Ab   |
| 22 PM                          |         |        |                 |              |              |                     |                                      | orl-rat 3430 mg/kg 3152a   | LDS0 SRM   | 072424<br>072424   |   | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |

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



**Certified Reference Material CRM** 



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

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

|                | <0.02 Cu <0.02 | <0.02 Co <0.02 | Be <0.01 Cr <0.02 Ga | <0.02 Cs <0.02 | <0.2 Cc <0.02 | <0.02 Ca <0.2 | <0.02 Cd <0.02 | THE PARTY OF ALL AND ADDRESS OF ALL ADDRESS OF ALL ADDRESS OF ADDRESS OF<br>ADDRESS OF ADDRESS OF ADDR |          |    |
|----------------|----------------|----------------|----------------------|----------------|---------------|---------------|----------------|---|----------|----|
|                | <0.02          | <0.02          | <0.02                | <0.02          | <0.02         | 40.02         | <0.02          | N No. of Lot 1941   |          |    |
|                | Pb             | La             | Fe                   | F              | In            | Ho            | Hf             |   |          |    |
|                | <0.02          | <0.02          | <0.2                 | <0.02          | <0.02         | <0.02         | <0.02          | Notice Inc.   | Irace Me |    |
|                | Nd             | Mo             | Hg                   | Mn             | Mg            | L             | C              |   | letals   |    |
| (T) = Tarc     | <0.02          | 40.02          | <0.2                 | <0.02          | <0.01         | <0.02         | <0.02          | A STATE OF     | Verifica |    |
| Taroet analyte | K              | 7              | ъ                    | Pd             | 0s            | Nb            | N              |   | TION     |    |
| vte            | -0.2           | <0.02          | <0.02                | <0.02          | <0.02         | <0.02         | <0.02          |   | OY ILP-N | 57 |
|                | Sc             | Sm             | Ru                   | Rb             | Rh            | Re            | Pr             | ALL STATES  |          | 5  |
|                | <0.02          | <0.02          | <0.02                | <0.02          | <0.02         | <0.02         | <0.02          | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   | g/mL)    |    |
|                | Ta             | ŝ              | Sr                   | Na             | Ag            | <u>8</u>      | %              |   |          |    |
|                | <0.02          | <0.02          | <0.02                | Т              | <0.02         | <0.02         | <0.2           |   |          |    |
|                | T              | Sn             | Tm                   | Th             | H             | Te            | Tb             |   |          |    |
|                | <0,02          | <0.02          | <0.02                | <0.02          | <0.02         | <0.02         | <0.02          | The second se   |          |    |
|                | Zr             | Zn             | Y                    | Yb             | <             | Ч             | W              |   |          |    |
|                | <0.02          | <0.02          | <0.02                | <0.02          | <0.02         | <0.02         | <0.02          |   |          |    |

**Physical Characterization:** 

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

In P. St.

Certified by:

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

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

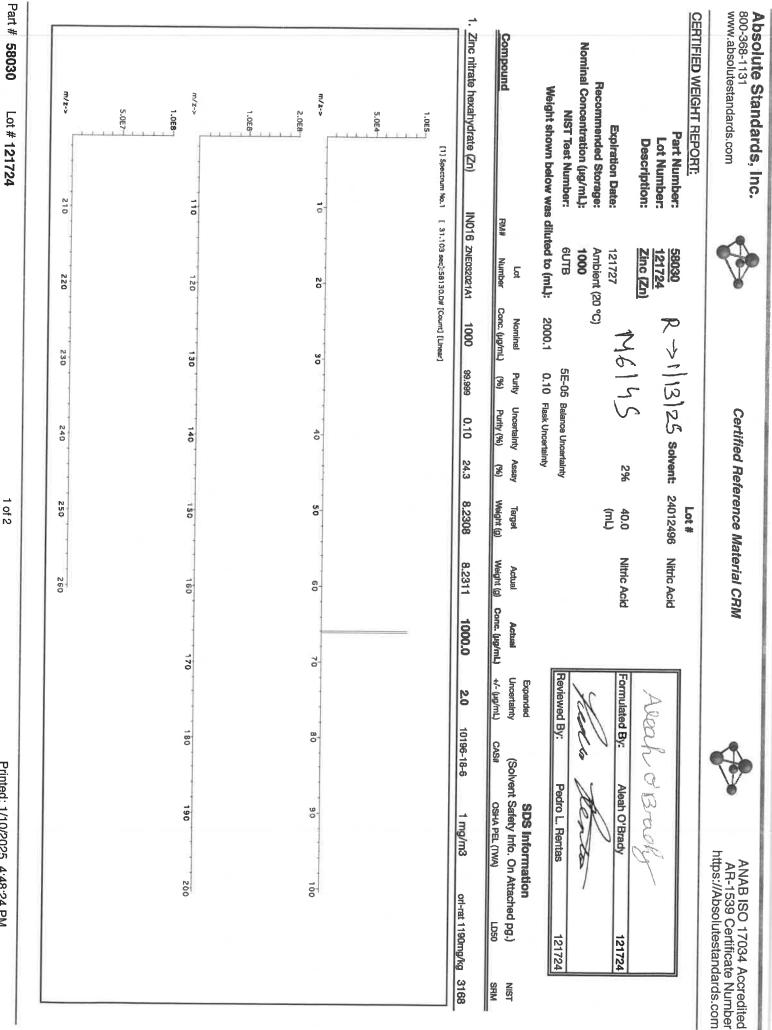
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All standard containers are meticulously cleaned prior to use.

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).



1 of 2

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|---------------------------|--------------|---------------------|
|                           |              | Inc.                |





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

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

|    |       |                |       |     |              |      | I race M | etais | Verifica |    | by icr- | NU<br>U | /9/111L/ | L  |       |    |       |    |       |
|----|-------|----------------|-------|-----|--------------|------|----------|-------|----------|----|---------|---------|----------|----|-------|----|-------|----|-------|
|    |       |                |       |     |              |      |          |       |          |    |         |         |          |    | 2     | 7  | 000   | W  | SUG   |
| A1 | cu u- | 1 64 1         | 000   | Dv  | <0.02        | Hf   | <0.02    | Li    | 40.02    | N  | 40.02   | Pr      | <0.02    | Se | 202   | 10 | 20.05 | W  | 20.02 |
| 2  | 10.01 | 1              |       | 1   | 2            | ,    | 3        | ;     | 200      | Ş  | 20.02   | R<br>P  | 20.02    | s  | <0.02 | Te | <0.02 | a  | <0.02 |
| S  | 20.02 | C <sub>2</sub> | 2.4   | ET  | 20.02        | 011  | 10.02    | 5     | 10.04    |    |         | 1       |          |    | 2     | 1  | 50.02 | <  | 33    |
| Å  | < 0 > | ç              | A) 02 | Eu  | <0.02        | h    | <0.02    | Mg    | <0.01    | õ  | <0.02   | Kh      | 20.02    | Ag | 20.02 | 11 | 10.02 |    | 10.01 |
|    | 5     | 2              | 200   | 2   | 202          | 7    | 2002     | š     | <0.02    | Pd | 40.02   | Rb      | <0.02    | Na | 401-2 | Th | <0.02 | Ц  | 20.02 |
| Da | 20.05 | ç              | 10.02 | 00  | 10.04        |      |          |       |          | 1  |         | ,       | 5        | ?  | 500   | 3  | 33    | <  | 40.02 |
| Be | <0.01 | Ŷ              | <0.02 | ନ୍ମ | <0.02        | Fe   | 40.2     | Hg    | 40.2     | ٢  | 20.02   | Ku      | 20.02    | ģ  | 10.02 |    |       | а, | -     |
| 2  | 500   | 2              | 3     | ç   | <n n=""></n> |      | AN 02    | Mo    | 40.02    | 7  | A).02   | Sm      | 40.02    | s  | <0.02 | Sn | 20.02 | 20 | -     |
| 10 | 10.01 | 8              |       |     |              | 2    | 2        |       | 3        | 2  | 50      | 2       | 202      | 12 | <0.02 | 1  | <0.02 | 1  | <0.02 |
| 8  | <0.02 | 5<br>5         | <0.02 | Au  | 20.02        | 1-10 | 20.02    | INC   | 20.02    | 7  | 104     | 24      | 40.00    | 1  |       |    |       |    |       |

(T) = Target analyte

**Physical Characterization:** 

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

Ser R. She

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 # 58030 Lot # 121724



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

16150

**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.
  - **<u>CAUTION</u>**: 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.

RMs ICV 1, 5, 6 SFAM.docx

Page 1 of 2

QATS Form 20-007F188R00, 04-19-2021



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"

| APTIM     | 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.

| ICV1-1014 |  |  |  |  |  |
|-----------|--|--|--|--|--|
| Element   | Concentration (µg/L)<br>(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  |  |  |  |

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

|         | ICV5-0415   | and a street | ICV6-0400   |
|---------|---|--------------|---|
| Element | Concentration (µg/L)<br>(after 100-fold dilution) | Analyte      | Concentration (µg/L)<br>(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     | D. L.       |
|---|-------------------|-------------|
| ACS - Assay (as HCI) (by acid-base titrn) |                   | Result      |
| ACS - Color (APHA)                        | 36.5 - 38.0 %     | 37.9 %      |
| ACS - Residue after Ignition              | ≤ 10              | 5           |
| ACS - Specific Gravity at 60°/60°F        | ≤ 3 ppm           | < 1 ppm     |
| ACS – Bromide (Br)                        | 1.185 - 1.192     | 1.191       |
| ACS - Extractable Organic Substances      | ≤ 0.005 %         | < 0.005 %   |
| ACS – Free Chlorine (as Cl <sub>2</sub> ) | ≤ 5 ppm           | < 1 ppm     |
| Phosphate (PO4)                           | ≤ 0.5 ppm         | < 0.5 ppm   |
| Sulfate (SO4)                             | ≤ 0.05 ppm        | < 0.03 ppm  |
| Sulfite (SO3)                             | ≤ 0.5 ppm         | < 0.3 ppm   |
| Ammonium (NH4)                            | ≤ 0.8 ppm         | 0.3 ppm     |
| Trace Impurities - Arsenic (As)           | ≤ 3 ppm           | < 1 ppm     |
| Trace Impurities - Aluminum (Al)          | ≤ 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   |
|   | ≤ 1.0 ppb         | 0.2 ppb     |
| Trace Impurities – Beryllium (Be)         | ≤ 1 <b>.0</b> ppb | < 0.2 ppb   |
| Trace Impurities - Bismuth (Bi)           | ≤ 10.0 ppb        | < 1.0 ppb   |
| Trace Impurities – Boron (B)              | ≤ 20.0 ppb        | < 5.0 ppb   |
| Trace Impurities - Cadmium (Cd)           | ≤ 1.0 ppb         | < 0.3 ppb   |
| Trace Impurities - Calcium (Ca)           | ≤ 50.0 ppb        | 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   |
| Trace Impurities - Germanium (Ge)         | ≤ 3.0 ppb         | < 2.0 ppb   |
| Trace Impurities – Gold (Au)              | ≤ 4.0 ppb         | 0.6 ppb     |
| Heavy Metals (as Pb)                      | ≤ 100 ppb         | < 50 ppb    |
| Trace 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    |
| Trace Impurities – Zirconium (Zr)                      | ≤ 1.0 ppb     | 0.3 ppb    |
|  |               | - FFF      |

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



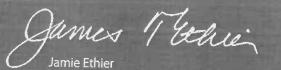


Material No.: 9530-33 Batch No.: 22G2862015

| 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



Vice President Global Quality



# **Certificate of Analysis**

Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

3.0

### 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).

R->1/7/25

M6153

F: 540-585-3012 info@inorganicventures.com

P: 800-669-6799/540-585-3030



### 2.0 PRODUCT DESCRIPTION

| Product Code:             | Single Analyte Custom Grade Solution   |
|---------------------------|--|
| Catalog Number:           | CGSR10                                 |
| Lot Number:               | V2-SR745329                            |
| Matrix:                   | 2% (v/v) HNO3                          |
| Value / Analyte(s):       | 10 000 μg/mL ea:<br>Strontium          |
| Starting Material:        | Strontium Carbonate                    |
| Starting Material Lot#:   | 2647                                   |
| Starting Material Purity: | 99.9960%                               |
| CERTIFIED VALUES AN       | ID UNCERTAINTIES                       |
| Certified Value:          | 10081 ± 39 μg/mL                       |
| Density:                  | 1.030 g/mL (measured at 20 $\pm$ 4 °C) |
| Assay Information:        |  |

EDTA NIST SRM 928 Lot Number: 928

- 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 u<sub>char</sub> i 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 (±) =  $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ 

k = coverage factor = 2

$$\begin{split} u_{char} &= [\widehat{\Sigma}] (w_{f})^2 \left( u_{char} \right)^2 )]^{5/2} \ \text{where} \ u_{char} \ i \ \text{are} \ \text{the errors from each characterization method} \\ u_{bb} &= \ \text{bottle to bottle homogeneity standard uncertainty} \\ u_{fts} &= \ \text{long term stability standard uncertainty (storage)} \end{split}$$

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where one method of characterization

- is used is the mean of individual results: X<sub>CRM/RM</sub> = (X<sub>a</sub>) (u<sub>char a</sub>)
  - Image: Contain and Contain and Containing and Cont

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k ( $u^2_{char a} + u^2_{bb} + u^2_{HS} + u^2_{TS}$ )<sup>½</sup> k = coverage factor = 2  $u_{char a}$  = the errors from characterization

$$\begin{split} u_{bb} &= \text{bottle to bottle homogeneity standard uncertainty} \\ u_{tts} &= \text{long term stability standard uncertainty (storage)} \\ u_{tts} &= \text{transport stability standard uncertainty} \end{split}$$

- 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.

| Μ | Ag | < | 0.000960 | М | Eu | < | 0.000480 | 0 | Na |   | 0.002964 | М | Se | < | 0.042000 | М | Zn | 0.004560 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|----------|
| М | AI |   | 0.003420 | 0 | Fe |   | 0.013225 | М | Nb | < | 0.000480 | 0 | Si |   | 0.012997 | М | Zr | 0.001847 |
| М | As | < | 0.007200 | M | Ga | < | 0.002900 | М | Nd | < | 0.000480 | М | Sm | < | 0.000480 |   |    |          |
| М | Au | < | 0.003900 | М | Gd | < | 0.000480 | 0 | Ni |   | 0.001482 | М | Sn | < | 0.000480 |   |    |          |
| ο | в  | < | 0.003200 | М | Ge | < | 0.004800 | М | Os | < | 0.001500 | s | Sr | < |          |   |    |          |
| М | Ва |   | 0.638494 | м | Hf | < | 0.000480 | 0 | Р  | < | 0.017000 | М | Та | < | 0.000480 |   |    |          |
| ο | Be | < | 0.000450 | м | Hg | < | 0.000960 | М | Pb |   | 0.010717 | М | ть | < | 0.000480 |   |    |          |
| М | Bi | < | 0.002000 | М | Ho | < | 0.000480 | М | Pd | < | 0.002000 | м | Те | < | 0.016000 |   |    |          |
| 0 | Ca |   | 0.025083 | м | In | < | 0.008600 | М | Pr |   | 0.000547 | м | Th | < | 0.000480 |   |    |          |
| М | Cd | < | 0.000960 | м | lr | < | 0.000480 | м | Pt | < | 0.000480 | М | Ті |   | 0.004560 |   |    |          |
| M | Ce |   | 0.000661 | 0 | ĸ  |   | 0.025083 | M | Rb | < | 0.003400 | M | ТІ | < | 0.000480 |   |    |          |
| M | Co |   | 0.001527 | м | La | < | 0.000480 |   | Re | < | 0.000480 |   | Tm |   | 0.004332 |   |    |          |
| 0 | Cr | < | 0.004700 |   | Li | < | 0.005600 |   | Rh | < | 0.013000 |   | U  | < | 0.000480 |   |    |          |
| M |    | < | 0.000480 | - |    |   | 0.000480 |   | Ru |   | 0.000960 |   | v  |   |          |   |    |          |
|   |    |   |          |   | Lu | < | +        |   |    | < |          |   | •  | < | 0.000960 |   |    |          |
| 0 | Cu | < | 0.003800 | 0 | Mg |   | 0.001048 | 0 | S  | < | 0.045000 | M | w  | < | 0.002400 |   |    |          |
| М | Dy | < | 0.000960 | 0 | Mn |   | 0.000319 | М | Sb | < | 0.009600 | о | Y  | < | 0.001200 |   |    |          |
| м | Er | < | 0.000480 | М | Мо | < | 0.002900 | М | Sc | < | 0.001500 | М | Yb | < | 0.000480 |   |    |          |
|   |    |   |          |   |    |   |          |   |    |   |          |   |    |   |          |   |    |          |

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>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. 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 <u>radial/axial</u> 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, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

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

### **11.1 Certification Issue Date**

### August 26, 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 26, 2029

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

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

### **11.3 Period of Validity**

- Sealed TCT Bag Open Date:

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

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

Uyen Truong Custom Processing Supervisor

### **Certificate Approved By:**

Muzzammil Khan Stock Laboratory Supervisor

Mayn Mun Mayni M Paul R Laina

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

Nitric Acid 69% CMOS





R-0210212025

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

| Test                              | Specification  | Result      |  |  |
|-----------------------------------|----------------|-------------|--|--|
| Assay (HNO3)                      | 69.0 - 70.0 %  |             |  |  |
| Appearance                        |                | 69.7 %      |  |  |
| Color (APHA)                      | Passes Test    | Passes Test |  |  |
| Residue after Ignition            | ≤ 10<br>- 2 mm | 5           |  |  |
| Chloride (Cl)                     | ≤ 2 ppm        | ) ppm       |  |  |
| Phosphate (PO4)                   | ≤ 0.08 ppm     | < 0.03 ppm  |  |  |
| Sulfate (SO4)                     | ≤ 0.10 ppm     | < 0.03 ppm  |  |  |
| Trace Impurities – Aluminum (Al)  | ≤ 0.2 ppm      | < 0.2 ppm   |  |  |
| Arsenic and Antimony (as As)      | ≤ 40.0 ppb     | < 1.0 ppb   |  |  |
| Trace Impurities – Barium (Ba)    | ≤ 5.0 ppb      | < 2.0 ppb   |  |  |
| Trace Impurities – Beryllium (Be) | ≤ 10.0 ppb     | < 1.0 ppb   |  |  |
| Trace Impurities – Bismuth (Bi)   | ≤ 10.0 ppb     | < 1.0 ppb   |  |  |
| Trace Impurities – Boron (B)      | ≤ 20.0 ppb     | < 10.0 ppb  |  |  |
| Trace Impurities - Cadmium (Cd)   | ≤ 10.0 ppb     | < 5.0 ppb   |  |  |
| Trace Impurities - Calcium (Ca)   | ≤ 50 ppb       | < 1 ppb     |  |  |
| Trace Impurities – Chromium (Cr)  | ≤ 50.0 ppb     | 2.3 ppb     |  |  |
| Trace Impurities – Cobalt (Co)    | ≤ 30.0 ppb     | < 1.0 ppb   |  |  |
| Frace Impurities – Copper (Cu)    | ≤ 10.0 ppb     | < 1.0 ppb   |  |  |
| Frace Impurities – Copper (Cd)    | ≤ 10.0 ppb     | < 1.0 ppb   |  |  |
|                                   | ≤ 10.0 ppb     | < 1.0 ppb   |  |  |
| race Impurities ~ Germanium (Ge)  | ≤ 20 ppb       | < 10 ppb    |  |  |
| race Impurities – Gold (Au)       | ≤ 20 ppb       | < 5 ppb     |  |  |
| leavy Metals (as Pb)              | ≤ 100 ppb      | 100 ppb     |  |  |
| race Impurities - Iron (Fe)       | ≤ 40.0 ppb     | < 1.0 ppb   |  |  |
| race Impurities – Lead (Pb)       | ≤ 20.0 ppb     | < 10.0 ppb  |  |  |
| race Impurities – Lithium (Li)    | ≤ 10.0 ppb     | < 1.0 ppb   |  |  |
| ace Impurities – Magnesium (Mg)   | ≤ 20 ppb       | < 1 ppb     |  |  |
| ace Impurities – Manganese (Mn)   | ≤ 10.0 ppb     | < 1.0 ppb   |  |  |
| ace Impurities - Nickel (Ni)      | ≤ 20.0 ppb     | < 5.0 ppb   |  |  |

>>> Continued on page 2 >>>

**Wavantor**<sup>\*\*</sup>



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

| Test                                | Specification | Result     |
|-------------------------------------|---------------|------------|
| Trace Impurities – Niobium (Nb)     | ≤ 50.0 ppb    |            |
| Trace Impurities – Potassium (K)    |               | < 1.0 ppb  |
| Trace Impurities - Silicon (Si)     | ≤ 50 ppb      | 16 ppb     |
| Trace Impurities - Silver (Ag)      | ≤ 50 ppb      | < 10 ppb   |
| •                                   | ≤ 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)    | ≤ 10.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Thallium (TI)    |               | < 5.0 ppb  |
| Trace Impurities - Tin (Sn)         | ≤ 10.0 ppb    | < 5.0 ppb  |
| Trace Impurities - Titanium (Ti)    | ≤ 20.0 ppb    | < 10.0 ppb |
|                                     | ≤ 10.0 ppb    | < 1.0 ppb  |
| Trace Impurities - Vanadium (V)     | ≤ 10.0 ppb    |            |
| Trace Impurities - Zinc (Zn)        | ≤ 20.0 ppb    | < 1.0 ppb  |
| Trace Impurities – Zirconium (Zr)   | ≤ 10.0 ppb    | < 1.0 ppb  |
| Particle Count - 0.5 µm and greater |               | < 1.0 ppb  |
| Particle Count - 1.0 µm and greater | ≤ 60 par/mi   | 10 par/ml  |
| and greater                         | ≤ 10 par/mi   | 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

Junie Croak Director Quality Operations, Bioscience Production

Nitric Acid 69% CMOS





M-5162 R. Date à- 0412712025

Material No.: 9606-03 Batch No.: 24H0162012 Manufactured Date: 2024-06-28 Retest Date: 2029-06-27 **Revision No.: 0** 

## **Certificate of Analysis**

| Test                              | Specification | Result      |  |
|-----------------------------------|---------------|-------------|--|
| Assay (HNO3)                      | 69.0 – 70.0 % | 69.7 %      |  |
| Appearance                        | Passes Test   | Passes Test |  |
| Color (APHA)                      | ≤ 10          | 5           |  |
| Residue after Ignition            | ≤ 2 ppm       | < 1 ppm     |  |
| Chloride (CI)                     | ≤ 0.08 ppm    | 0.03 ppm    |  |
| Phosphate (PO4)                   | ≤ 0.10 ppm    | < 0.03 ppm  |  |
| Sulfate (SO4)                     | ≤ 0.2 ppm     | < 0.2 ppm   |  |
| Trace Impurities - Aluminum (Al)  | ≤ 40.0 ppb    | < 1.0 ppb   |  |
| Arsenic and Antimony (as As)      | ≤ 5.0 ppb     | < 2.0 ppb   |  |
| Trace Impurities – Barium (Ba)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Beryllium (Be) | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Bismuth (Bi)   | ≤ 20.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Boron (B)      | ≤ 10.0 ppb    | 0.1 ppb     |  |
| Trace impurities - Cadmium (Cd)   | ≤ 50 ppb      | < 1 ppb     |  |
| Trace Impurities – Calcium (Ca)   | ≤ 50.0 ppb    | 0.3 ppb     |  |
| Trace Impurities - Chromium (Cr)  | ≤ 30.0 ppb    | 0.1 ppb     |  |
| Trace Impurities – Cobalt (Co)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Copper (Cu)    | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Gallium (Ga)   | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Germanium (Ge) | ≤ 20 ppb      | < 1 ppb     |  |
| Trace Impurities – Gold (Au)      | ≤ 20 ppb      | < 1 ppb     |  |
| Heavy Metals (as Pb)              | ≤ 100 ppb     | < 50 ppb    |  |
| Trace Impurities – Iron (Fe)      | ≤ 40.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Lead (Pb)      | ≤ 20.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Lithium (Li)   | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities - Magnesium (Mg) | ≤ 20 ppb      | < 1 ppb     |  |
| Trace Impurities - Manganese (Mn) | ≤ 10.0 ppb    | < 1.0 ppb   |  |
| Trace Impurities – Nickel (Ni)    | ≤ 20.0 ppb    | < 1.0 ppb   |  |

>>> Continued on page 2 >>>





### Material No.: 9606-03 Batch No.: 24H0162012

| Test                                | Specification | Result    |
|-------------------------------------|---------------|-----------|
| Trace Impurities - Niobium (Nb)     | ≤ 50.0 ppb    | < 1.0 ppb |
| Trace Impurities – Potassium (K)    | ≤ 50 ppb      | < 1 ppb   |
| Trace Impurities – Silicon (Si)     | ≤ 50 ppb      | 1 ppb     |
| Trace Impurities – Silver (Ag)      | ≤ 20.0 ppb    | < 1.0 ppb |
| Trace Impurities – Sodium (Na)      | ≤ 150.0 ppb   | < 1.0 ppb |
| Trace Impurities – Strontium (Sr)   | ≤ 30.0 ppb    | < 1.0 ppb |
| Trace Impurities – Tantalum (Ta)    | ≤ 10.0 ppb    | < 1.0 ppb |
| Trace Impurities – Thallium (TI)    | ≤ 10.0 ppb    | < 1.0 ppb |
| Trace Impurities – Tin (Sn)         | ≤ 20.0 ppb    | < 1.0 ppb |
| Trace Impurities - Titanium (Ti)    | ≤ 10.0 ppb    | < 1.0 ppb |
| Trace Impurities - Vanadium (V)     | ≤ 10.0 ppb    | < 1.0 ppb |
| Trace Impurities – Zinc (Zn)        | ≤ 20.0 ppb    | < 1.0 ppb |
| Trace Impurities - Zirconium (Zr)   | ≤ 10.0 ppb    | < 1.0 ppb |
| Particle Count – 0.5 µm and greater | ≤ 60 par/ml   | 13 par/ml |
| Particle Count - 1.0 µm and greater | ≤ 10 par/mł   | 5 par/ml  |
|                                     |               |           |

>>> Continued on page 3 >>>

Nitric Acid 69% CMOS





### Material No.: 9606-03 Batch No.: 24H0162012

| Test | Specification | Result |  |
|------|---------------|--------|--|
|------|---------------|--------|--|

For Microelectronic Use

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



Certificate of Analysis M5738 M&739 M5740 MS741 M5742 Refine your results. Redefine your industry.

VENTURES

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M5743

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).

A: 4/11/22



### 2.0 **PRODUCT DESCRIPTION**

| Product Code:       | Multi Analyte Custom Grade Soluti | on         |
|---------------------|-----------------------------------|------------|
| Catalog Number:     | 6020ISS                           |            |
| Lot Number:         | \$2-MEB709511                     |            |
| Matrix:             | 7% (v/v) HNO3                     |            |
| Value / Analyte(s): | 10 μg/mL ea:                      |            |
|                     | Bismuth,                          | Holmium,   |
|                     | Indium,                           | 6-Lithium, |
|                     | Rhodium,                          | Scandium,  |
|                     | Terbium,                          | Yttrium    |

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

| ANALYTE<br>6-Lithium, Li6 | CERTIFIED VALUE<br>10.00 ± 0.03 µg/mL | ANALYTE<br>Bismuth, Bi | CERTIFIED VALUE<br>10.00 ± 0.05 µg/mL |
|---------------------------|---------------------------------------|------------------------|---------------------------------------|
| Holmium, Ho               | 10.00 ± 0.05 µg/mL                    | Indium, In             | 10.00 ± 0.04 µg/mL                    |
| Rhodium, Rh               | 10.00 ± 0.07 µg/mL                    | Scandlum, Sc           | 10.00 ± 0.04 µg/mL                    |
| Terbium, Tb               | 10.00 ± 0.04 µg/mL                    | Yttrium, Y             | 10.00 ± 0.04 µg/mL                    |

**Density:** 

1.035 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

| ANALYTE<br>Bi | METHOD<br>ICP Assay | NIST SRM#<br>3106 | SRM LOT#<br>180815 |
|---------------|---------------------|-------------------|--------------------|
| Bi            | Calculated          |                   | See Sec. 4.2       |
| Но            | ICP Assay           | 3123a             | 090408             |
| Но            | EDTA                | 928               | 928                |
| In            | ICP Assay           | 3124a             | 110516             |
| In            | EDTA                | 928               | 928                |
| In            | Calculated          |                   | See Sec. 4.2       |
| Li6           | Gravimetric         |                   | See Sec. 4.2       |
| Rh            | ICP Assay           | 3144              | 070619             |
| Sc            | ICP Assay           | 3148a             | 100701             |
| Sc            | EDTA                | 928               | 928                |
| Тb            | ICP Assay           | 3157a             | 100518             |
| Tb            | EDTA                | 928               | 928                |
| Тb            | Calculated          |                   | See Sec. 4,2       |
| Y             | ICP Assay           | 3167a             | 120314             |
| Y             | EDTA                | 928               | 928                |
| Y             | Calculated          |                   | See Sec. 4.2       |
|               |                     |                   |                    |

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

| Characterization of CRM/RM by Two or More Methods   | Characterization of CRM/RM by One Method   |
|---|--|
| Certified Value, X <sub>CRWRM</sub> , where two or more methods of characterization are<br>used is the weighted mean of the results:  | Certified Value, X <sub>CRMRM</sub> , where one method of characterization<br>is used is the mean of individual results:   |
| X <sub>CRM/RM</sub> = Σ(w <sub>i</sub> ) (X <sub>i</sub> )<br>X <sub>i</sub> = mean of Assay Method I with standard uncertainty u <sub>char</sub> i<br>w <sub>i</sub> ≃ the weighting factors for each method calculated using the inverse square of<br>the variance:<br>w <sub>i</sub> = (1/u <sub>char</sub> ) <sup>2</sup> / (Σ(1/u <sub>char</sub> ) <sup>2</sup> )   | $X_{CRM/RM} = \{X_a\} (u_{cher} a)$<br>$X_a = mean of Assay Method A withu_{cher} a = the standard uncertainty of characterization Method A$   |
| $w_{1} = (1)^{1/2} char i^{1/2} (2(1)^{1/2} char i^{1/2})$ CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>lts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>1/2</sup> k = coverage factor = 2 u <sub>char</sub> = (E((w)) <sup>2</sup> (u <sub>char</sub> ) <sup>2</sup> )] <sup>1/2</sup> where u <sub>char</sub> i are the errors from each characterization method u <sub>bb</sub> = bolte to bottle homogeneity standard uncertainty u <sub>lts</sub> = long term stability standard uncertainty u <sub>bb</sub> = transport stability standard uncertainty | CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k ( $u^2_{char a} + u^2_{bb} + u^2_{fts} + u^2_{ts}$ ) <sup>1/2</sup><br>k = coverage factor = 2<br>u <sub>char a</sub> = the encus from characterization<br>u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty<br>u <sub>fts</sub> = long term stability standard uncertainty (storage)<br>u <sub>tts</sub> = transport stability standard uncertainty |
| ertified Abundance:   |  |
| We Certified Abundance  |  |

|    | 1.4 | э | CEI | unea | Moundance |     |
|----|-----|---|-----|------|-----------|-----|
| te | m   |   |     |      |           | Δt. |

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

### 4.0 **TRACEABILITY TO NIST**

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

### 4.1 Thermometer Calibration

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

### **4.2 Balance Calibration**

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

### **4.3 Glassware Calibration**

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

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

N/A

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### **11.1 Certification Issue Date**

### September 03, 2021

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

### 11.2 Lot Expiration Date

### - September 03, 2026

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

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

### 11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Bath

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

Paul R Laine

RD: 07/14/2022



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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

### Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of an Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-0803" and for the ICSAB mixture use "ICSA-0803+ICSB-0803".

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

### (B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to the Contracting Officer, Ross Miller at <u>miller.ross@epa.gov</u>. If directed by Ross Miller, return the chain of custody record with appropriate annotations and signatures to the address provided below.

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

### (C) ANALYSIS OF SAMPLES

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

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



Page 1 of 2



ICSB: M5874

**ICSA-0803, Inferferents:** Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this solution by ICP-MS.

**ICSB-0803, Analytes, mixed with ICSA-0803, Interferents:** Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-MS.

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

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

| Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-MS<br>ICSA-0803, AND ICSA-0803 MIXED WITH ICSB-0803 |      |                  |                          |                          |                             |                          |                          |
|---|------|------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element   | CRQL | Part A<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(µg/L) | Part A<br>+Part B<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(µg/L) |
| AI  | 20.0 | [100000]         |                          |                          | [100000]                    |                          |                          |
| Sb  | 2.0  | (1.5)            | -2.5                     | 5.5                      | (22.0)                      | 18.0                     | 26.0                     |
| As  | 1.0  | (0.1)            | -1.9                     | 2.1                      | 19.0                        | 16.2                     | 21.9                     |
| Ba  | 10.0 | (1.2)            | -18.8                    | 21.2                     | (22.0)                      | 2.0                      | 42.0                     |
| Be  | 1.0  | (0)              | -2.0                     | 2.0                      | 19.0                        | 16.2                     | 21.9                     |
| Cd  | 1.0  | (0.7)            | -1.3                     | 2.7                      | 20.0                        | 17.0                     | 23.0                     |
| Ca  | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| С   |      | [200000]         |                          |                          | [200000]                    |                          |                          |
| CI  |      | [1000000]        |                          |                          | [1000000]                   |                          |                          |
| Cr  | 2.0  | (21.0)           | 17.0                     | 25.0                     | 40.0                        | 34.0                     | 46.0                     |
| Co  | 1.0  | (1.0)            | -1.0                     | 3.0                      | 20.0                        | 17.0                     | 23.0                     |
| Cu  | 2.0  | (8.0)            | 4.0                      | 12.0                     | (25.0)                      | 21.0                     | 29.0                     |
| Fe  | 200  | [100000]         |                          |                          | [100000]                    |                          |                          |
| Pb  | 1.0  | (4.0)            | 2.0                      | 6.0                      | 25.0                        | 21.3                     | 28.8                     |
| Mg  | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| Mn  | 1.0  | (7.0)            | 5.0                      | 9.0                      | 27.0                        | 23.0                     | 31.1                     |
| Мо  |      | [2000]           |                          |                          | [2000]                      |                          |                          |
| Ni  | 1.0  | (6.0)            | 4.0                      | 8.0                      | 24.0                        | 20.4                     | 27.6                     |
| Р   |      | [100000]         |                          |                          | [100000]                    |                          |                          |
| K   | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| Se  | 5.0  | (0.3)            | -9.7                     | 10.3                     | (19.0)                      | 9.0                      | 29.0                     |
| Ag  | 1.0  | (0)              | -2.0                     | 2.0                      | 18.0                        | 15.3                     | 20.7                     |
| Na  | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| S   |      | [100000]         |                          |                          | [100000]                    |                          |                          |
| TI  | 1.0  | (0)              | -2.0                     | 2.0                      | 21.0                        | 17.9                     | 24.2                     |
| Ti  |      | [2000]           |                          |                          | [2000]                      |                          |                          |
| V   | 5.0  | (0.5)            | -9.5                     | 10.5                     | (19.0)                      | 9.0                      | 29.0                     |
| Zn  | 5.0  | (11.0)           | 1.0                      | 21.0                     | (29.0)                      | 19.0                     | 39.0                     |

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

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value  $\pm$  2 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value  $\pm$  15 percent of the listed certified value.

ICSA: M5873

RD: 07/14/2022



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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

### Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of an Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-0803" and for the ICSAB mixture use "ICSA-0803+ICSB-0803".

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

### (B) BREAKAGE OR MISSING ITEMS

Check the contents of the shipment carefully for any broken, leaking, or missing items. Check that the seal is intact on each bottle. Refer to the enclosed chain of custody record. Report any problems to the Contracting Officer, Ross Miller at <u>miller.ross@epa.gov</u>. If directed by Ross Miller, return the chain of custody record with appropriate annotations and signatures to the address provided below.

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

### (C) ANALYSIS OF SAMPLES

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

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



Page 1 of 2



ICSB: M5874

**ICSA-0803, Inferferents:** Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this solution by ICP-MS.

**ICSB-0803, Analytes, mixed with ICSA-0803, Interferents:** Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-MS.

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

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

| Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-MS<br>ICSA-0803, AND ICSA-0803 MIXED WITH ICSB-0803 |      |                  |                          |                          |                             |                          |                          |
|---|------|------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element   | CRQL | Part A<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(µg/L) | Part A<br>+Part B<br>(µg/L) | Lower<br>Limit<br>(µg/L) | Upper<br>Limit<br>(µg/L) |
| AI  | 20.0 | [100000]         |                          |                          | [100000]                    |                          |                          |
| Sb  | 2.0  | (1.5)            | -2.5                     | 5.5                      | (22.0)                      | 18.0                     | 26.0                     |
| As  | 1.0  | (0.1)            | -1.9                     | 2.1                      | 19.0                        | 16.2                     | 21.9                     |
| Ba  | 10.0 | (1.2)            | -18.8                    | 21.2                     | (22.0)                      | 2.0                      | 42.0                     |
| Be  | 1.0  | (0)              | -2.0                     | 2.0                      | 19.0                        | 16.2                     | 21.9                     |
| Cd  | 1.0  | (0.7)            | -1.3                     | 2.7                      | 20.0                        | 17.0                     | 23.0                     |
| Ca  | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| С   |      | [200000]         |                          |                          | [200000]                    |                          |                          |
| CI  |      | [1000000]        |                          |                          | [1000000]                   |                          |                          |
| Cr  | 2.0  | (21.0)           | 17.0                     | 25.0                     | 40.0                        | 34.0                     | 46.0                     |
| Co  | 1.0  | (1.0)            | -1.0                     | 3.0                      | 20.0                        | 17.0                     | 23.0                     |
| Cu  | 2.0  | (8.0)            | 4.0                      | 12.0                     | (25.0)                      | 21.0                     | 29.0                     |
| Fe  | 200  | [100000]         |                          |                          | [100000]                    |                          |                          |
| Pb  | 1.0  | (4.0)            | 2.0                      | 6.0                      | 25.0                        | 21.3                     | 28.8                     |
| Mg  | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| Mn  | 1.0  | (7.0)            | 5.0                      | 9.0                      | 27.0                        | 23.0                     | 31.1                     |
| Мо  |      | [2000]           |                          |                          | [2000]                      |                          |                          |
| Ni  | 1.0  | (6.0)            | 4.0                      | 8.0                      | 24.0                        | 20.4                     | 27.6                     |
| Р   |      | [100000]         |                          |                          | [100000]                    |                          |                          |
| K   | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| Se  | 5.0  | (0.3)            | -9.7                     | 10.3                     | (19.0)                      | 9.0                      | 29.0                     |
| Ag  | 1.0  | (0)              | -2.0                     | 2.0                      | 18.0                        | 15.3                     | 20.7                     |
| Na  | 500  | [100000]         |                          |                          | [100000]                    |                          |                          |
| S   |      | [100000]         |                          |                          | [100000]                    |                          |                          |
| TI  | 1.0  | (0)              | -2.0                     | 2.0                      | 21.0                        | 17.9                     | 24.2                     |
| Ti  |      | [2000]           |                          |                          | [2000]                      |                          |                          |
| V   | 5.0  | (0.5)            | -9.5                     | 10.5                     | (19.0)                      | 9.0                      | 29.0                     |
| Zn  | 5.0  | (11.0)           | 1.0                      | 21.0                     | (29.0)                      | 19.0                     | 39.0                     |

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

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value  $\pm$  2 times the associated CLP SOW CRQL. The acceptance ranges for all other analytes were determined using the certified value  $\pm$  15 percent of the listed certified value.

ICSA: M5873

| N<br>55<br>10<br>0 | m/z-> 110<br>5.0E6 | រា<br>.0<br>៣<br>ភា | m/≥-> 10 | ហ<br>.0<br>៣<br>៥ | [1] Spectrum No.1<br>1.0E7            | 1. Silver nitrate (Ag) | Compound   | Part Number:       57047         Lot Number:       122823         Description:       Silver (A         Description:       Silver (A         Expiration Date:       122826         Recommended Storage:       Ambient (;         Nominal Concentration (µg/mL):       1000         NIST Test Number:       6UTB         Weight shown below was diluted to (mL): | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com<br>CERTIFIED WEIGHT REPORT: |
|--------------------|--------------------|---------------------|----------|-------------------|---------------------------------------|------------------------|--|--|---|
|                    | 120                |                     | N.       |                   | -                                     | 5 J0612AGA1            | Lot Nor<br>RM# Number Conc. (  | 57047<br>122823<br>Silver (Ag)<br>122826<br>Ambient (20<br>Ambient (20<br>1000<br>6UTB<br>6UTB   | -   |
|                    | 130<br>140         |                     | 90<br>40 |                   | 14.044 sec]:58147.D# [Count] [Linear] | 88.8988 0.10           | Nominal Purity Uncertainty Assay<br>Conc. (Jug/mL) (96) Purity (96) (96)           | *C)<br>5E-05 Balance Uncertainty   | Certified I<br>R 1 8   5   2 4  |
|                    | 1<br>ភូ-<br>O      |                     | 50       |                   | [Count] [Linear]                      | 6.27992                | Target<br>Weight (g)   | n <b>t:</b> 24002546<br>2% 80.0<br>(mL)  | Certified Reference Material  |
|                    | 160 170            |                     | 60 70    |                   |                                       | 1000.0                 | Actual Actual U<br>Weight (g) Conc. (µg/mL) +                                      | Nitric Acid  | rial CRM M6030  |
|                    | 180                |                     | 80       |                   |                                       | <b>2.0</b> 7761-88-8   | Expanded<br>Uncertainty (Solv<br>+/- (µg/mL) CAS#                                  | ad By:   | )30   |
|                    | 190 200            |                     | 90 100   |                   |                                       | 10 ug/m3               | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD51 | Benson Chan<br>Pedro L. Rentas   | http  |
|                    | ŏ                  |                     | ŏ        |                   |                                       |                        | n<br>ached pg.) NIST<br>LD50 SRM   | 122823   | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com          |

Part # 57047 Lot # 122823

1 of 2

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

|    |              |   |            |          |                    |          |            | -lecais              | VCITICA |     | by ICFT                | SIC 1 | hailer                |          |       |     |       |    |       |
|----|--------------|---|------------|----------|--------------------|----------|------------|----------------------|---------|-----|------------------------|-------|-----------------------|----------|-------|-----|-------|----|-------|
|    |              |   | The shares | A COLUMN | Contraction of the | State of | UNIX 2 COL | 18 - <sup>1</sup> 19 |         | 100 | The state of the state |       | 1.40 . 10 . 10 . 10 E | No.      |       | No. |       |    |       |
| A  | <0.02        | 8 | <0.02      | Dy       | <0.02              | Hf       | <0.02      | 5                    | <0.02   | N   | <0.02                  | 7     | <0.02                 | Se       | <0.2  | ТЪ  | <0.02 | W  | <0.02 |
| Sb | <0.02        | ß | <0.2       | 막        | 40.02              | Но       | <0.02      | Lu                   | <0.02   | ĥ   | <0.02                  | Re    | <0.02                 | <u>8</u> | <0.02 | Te  | <0.02 | q  | <0.02 |
| As | <b>4</b> 0.2 | ĉ | <0.02      | 땹        | <0.02              | h        | <0.02      | Mg                   | <0.01   | õ   | <0.02                  | Rh    | <0.02                 | Ag       | T     | 1   | <0.02 | <  | <0.02 |
| Ba | <0.02        | S | <0.02      | ନ୍ଥ      | <0.02              | Ħ        | <0.02      | Mn                   | <0.02   | Pd  | <0.02                  | Rb    | <0.02                 | Na       | <0.2  | Ţ   | <0.02 | YЪ | <0.02 |
| Be | <0.01        | Ω | <0.02      | ଦ୍ଧ      | <0.02              | Fe       | <0.2       | Hg                   | 40.2    | p   | <0.02                  | Ru    | <0.02                 | ş        | <0.02 | Tm  | <0.02 | ×  | <0.02 |
| B  | <0.02        | S | <0.02      | ନ୍ନ      | <0.02              | L        | <0.02      | Mo                   | <0.02   | Ŗ   | <0.02                  | Sm    | <0.02                 | Ś        | <0.02 | Sh  | <0.02 | 2  | <0.02 |
| μ. | <0.02        | ß | <0.02      | Au       | <0.02              | Pb       | <0.02      | Nd                   | <0.02   | K   | <b>40</b> 2            | Ş     | <0.02                 | Ta       | <0.02 | Ð   | <0.02 | 2  | <0.02 |

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

**Physical Characterization:** 

(T)= Target analyte

Certified by:

In & She

\* 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).

|          | ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com | 071724   | NIST<br>SRM  | ig/kg 3102a        |   |   |                         |       |
|----------|--|--|--|--------------------|---|---|-------------------------|-------|
|          | VAB ISO 170<br>R-1539 Certif<br>s://Absolutes  |  | ation<br>h Attached pg.)<br>) LD50   | orl-rat 7000 mg/kg |   | 0   | 500                     |       |
|          | http   | Giovanni Esposito  | SDS Information<br>(Solvent Safety Info. On Attached pg.)<br># OSHA PEL (TWA) LD50 | 0.5 mg/m3          |   | 06  | 190                     |       |
|          |  | Hibranthie E<br>mulated By:<br>Keen a  | CAS  | 7440-36-0          |   | С<br>Ю  | 180                     |       |
|          |  | Rej For  | Expanded<br>Uncertainty<br>/mL) +/- (µg/mL)  | 0 2.2              |   | 02  | 170                     |       |
|          | al CRM   | ent:<br>Acid<br>0 Nitric Acid<br>-)  | al Final<br>g/mL) Conc. (µg/mL)  | 1.4 1000.0         |   | G   | 160                     | 0     |
|          | ence Materi  | Lot # Solvent:<br>24002546 Nitric Acid<br>2.0% 40.0<br>(mL)  | Nominal Initial<br>II. (µg/mL) Conc. (µg/mL)                                       | 1000 10001.4       | ıtl [Linear]  | 0   | 150                     | 0.00  |
| 3/24/25  | Certified Reference Material CRM   |  | Flask Uncertainty<br>Uncertainty Nominal<br>Pipette (mL) Conc. ( <i>µg/m</i> L)    | 0.084 10           | 17.964 sec]:58051.D# [Count] [Linear]   | 64  | 04                      | 240   |
| opened : | ÿ  | 60<br>5E-05  | 0.058<br>Initial<br>Vol. (mL)  | 200.0              | sec]:5805   | <del>0</del>  | 0                       | 530   |
| 0        |  |  | -): 2000.26<br>Dilution  | 1 0.1000           | 17.964  |   |                         |       |
|          |  | 57051<br>071724<br>Antimony (Sb<br>071727<br>Ambient (20 °C)<br>1000<br>6UTB   | <b>as diluted to (ml</b><br>Part Lot<br><u>Number Number</u>                       | 58151 060324       | C<br>C<br>Z   | 0   | 00                      | 220   |
|          | <b>irds, Inc.</b><br>s.com   | Concentration (ug/mL):   | Volume shown below was diluted to (mL):<br>Part Lot<br>Number Number               | 25                 | [1] Spectrum No.1   | 0   |                         | 210   |
|          | Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    | CERTIFIED WEIGHT REPORT<br>Part Number:<br>Lot Number:<br>Lot Number:<br>Description:<br>Expiration Date:<br>Recommended Storage:<br>Nominal Concentration (µg/mL):<br>NIST Test Number: | Volume   | 1. Antimony (Sb)   | 20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>2 | m/z-≻<br>2.55<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2. | m/z-><br>2.0E7<br>1.0E7 | ~-×/₩ |

Part # 57051 Lot # 071724

1 of 2

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





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

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

**Physical Characterization:** 

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

Certified by:

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

the preparation of all standards.

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

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

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

2 of 2



# **Certificate of Analysis**

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:<br>Strontium         |
| Starting Material:        | SrCO3                                |
| Starting Material Lot#:   | M2-2192                              |
| Starting Material Purity: | 99.9993%                             |
| CERTIFIED VALUES AN       | ID UNCERTAINTIES                     |

| Certified Value: | 1001 ± 3 µg/mL                         |
|------------------|--|
| Density:         | 1.000 g/mL (measured at 20 $\pm$ 4 °C) |

Assay Information:

3.0

| Assay Method #1 | <b>998 ± 4 μg/mL</b><br>ICP Assay NIST SRM Traceable to 3153a Lot Number: K2-SR650985 |
|-----------------|---|
| Assay Method #2 | <b>1001 ± 3 μg/mL</b><br>EDTA NIST SRM 928 Lot Number: 928                            |
| Assay Method #3 | <b>1001 ± 2 µg/mL</b><br>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 u<sub>char</sub> i 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<sub>CRM/RM</sub> = k ( $u^2_{cher} + u^2_{bb} + u^2_{lts} + u^2_{ts}$ )<sup>1/2</sup> k = coverage factor = 2  $u_{cher} = [Z(w_i)^2 (u_{char} i)^2]$ <sup>1/2</sup> where  $u_{char}$  i are the errors from each characterization method  $u_{bb}$  = bottle to bottle homogeneity standard uncertainty

bb - boute to outer homogeneity sandard uncertainty utrs = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

### Characterization of CRM/RM by One Method

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

 $X_{CRM/RM} = (X_n) (u_{char e})$   $X_n = mean of Assay Method A with$  $<math>u_{char a} =$ the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k ( $u^2_{char a} + u^2_{bb} + u^2_{tts} + u^2_{ts}$ )<sup>1/2</sup> k = coverage factor = 2 uchar a = the errors from characterization u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty u<sub>its</sub> = long term stability standard uncertainty (storage) u<sub>its</sub> = transport stability standard uncertainty

- 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 | < | 0.001980 | М | Eu | < | 0.000495 | 0   | Na |   | 0.000200 | М | Se | < | 0.013862 | 0 | Zn |   | 0.000143 |
|---|----|---|----------|---|----|---|----------|-----|----|---|----------|---|----|---|----------|---|----|---|----------|
| 0 | A  |   | 0.000370 | 0 | Fe |   | 0.000410 | М   | Nb | < | 0.000495 | i | Si | < |          | М | Zr | < | 0.000495 |
| М | As | < | 0.000495 | М | Ga | < | 0.000495 | М   | Nd | < | 0.000495 | М | Sm | < | 0.000495 |   |    |   |          |
| М | Au | < | 0.000989 | М | Gd | < | 0.000495 | 0   | Ni | < | 0.007631 | М | Sn | < | 0.000990 |   |    |   |          |
| М | в  | < | 0.039606 | М | Ge | < | 0.000495 | М   | Os | < | 0.000494 | s | Sr | < |          |   |    |   |          |
| М | Ba |   | 0.006486 | М | Hf | < | 0.000495 | i – | Р  | < |          | М | Та | < | 0.000495 |   |    |   |          |
| М | Be | < | 0.000990 | M | Hg | < | 0.000989 | М   | Pb | < | 0.002970 | М | Tb | < | 0.000495 |   |    |   |          |
| М | Bi | < | 0.000495 | М | Но | < | 0.000495 | М   | Pd | < | 0.003957 | М | Те | < | 0.027724 |   |    |   |          |
| 0 | Ca |   | 0.004255 | М | In | < | 0.000495 | М   | Pr | < | 0.000495 | M | Th | < | 0.000990 |   |    |   |          |
| М | Cd |   | 0.001339 | Μ | lr | < | 0.000494 | М   | Pt | < | 0.002970 | М | Ti | < | 0.005940 |   |    |   |          |
| М | Ce | < | 0.004950 | 0 | к  | < | 0.008184 | М   | Rb | < | 0.002970 | М | TI | < | 0.000495 |   |    |   |          |
| М | Со | < | 0.000495 | М | 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 | М | Lu | < | 0.002970 | М   | Ru | < | 0.000989 | М | V  | < | 0.001980 |   |    |   |          |
| М | 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 | Y  | < | 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<sup>™</sup>) see the Limited License to Use PCRM<sup>™</sup> in the Inorganic Ventures Terms and Conditions of Sale. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM<sup>™</sup> 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 HCI, 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     | Ce  |
|                    |                        |       |   |

### 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

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

### 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.

### NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

BD9784.

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director

| 800-368-1131<br>www.absolutestandards.com  | CERTIFIED WEIGHT REPORT: | Par<br>Loi<br>De                            | Expiration Date:<br>Recommended Storage: | NIST Tex                  | Weight showr                            |   | Compound                 |                                       | N. O | 1.000 | m/z->   | 1.0E4 | 5<br>0<br>0 | m/z->- | 1.0世8 | 5.<br>0<br>8 | ITVZ-> |
|--|--------------------------|---|--|---------------------------|---|---|--------------------------|---------------------------------------|------|-------|---------|-------|-------------|--------|-------|--------------|--------|
|  | E                        | Part Number:<br>Lot Number:<br>Description: | Expiration Date:<br>nended Storage:      | NIST Test Number:         | Weight shown below was diluted to (mL): |   | VIMH.                    | [1] Spectrum No.1                     |      |       | 10      |       |             | 110    |       |              | 012    |
|  |                          | <u>57081</u><br>062724<br>Thalllum (TI)     | 062727<br>Ambient (20 °C)                | 6UTB                      | ed to (mL):                             | Lot   | Number                   | -                                     |      |       | N       |       |             | 120    |       |              | 220    |
|  |                          |   | °C)                                      | 58                        | 2000.1 0                                | Nominal Pi  | Conc. (J/g/mL)           | 14.044 sec                            |      |       | a<br>o  |       |             | 130    |       |              | 230    |
| Certified Refi<br>R ! 8]5]24   |                          | Š   |  | 5E-05 Balance Uncertainty | 0.10 Flask Uncertainty                  | Purity Uncertainty Assay                                  | (%) PUTTY (%)            | 14.044 sec]:57081.D# [Count] [Linear] |      |       | 4.<br>0 |       |             | 140    |       |              | 240    |
| Certified Reference Material CRM<br>とという   |                          | Solvent: 2400                               | 2% 40<br>(m                              | pertainty                 | ainty                                   | y Assay Target  | (%) Weight (g)           | ₩ [Count] [Li                         |      |       | 01      |       |             | 150    |       |              | 250    |
| e Material   |                          | 24002546 Nitric Acid                        | 40.0 Nitric Acid<br>(mL)                 |                           |   | get Actual  |                          | [Linear]                              |      |       |         |       |             |        |       |              |        |
| <b>СRМ</b><br>М6023  |                          | Acid  | cid                                      |                           |   | Actual  | Weight (g) Conc. (µg/mL) |                                       |      |       | 8       |       |             | 160    |       |              | 260    |
| 23   |                          | Alea  | Formulated By:                           | Reviewed By:              |   | Expanded<br>Uncertainty                                   | L) +/- (µg/mL)           |                                       |      |       | 70      |       |             | 170    |       |              |        |
|  |                          | 20  | 8  |                           |   | (Solvent  | CAS#                     |                                       |      |       | 80      |       |             | 180    |       |              |        |
| http   |                          | Grandly                                     | Aleah O'Brady                            | Pedro L. Rentas           |   | SDS Information<br>Safety Info. On Atta                   | OSHA PEL (TWA)           |                                       |      |       | 8       |       |             | 190    |       |              |        |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |                          |   | 062724                                   | 062724                    |   | SDS Information<br>(Solvent Safety Info. On Attached pg.) | DSG1                     |                                       |      |       | 100     |       |             | 200    |       |              |        |
| Accredite<br>te Numbe<br>dards.con   | ٤                        |   | 4  | 4                         | l                                       | NIST  | SKM                      |                                       |      |       |         |       |             |        |       |              |        |

Part # 57081 Lot # 062724

1 of 2

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| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com |
|---|
|---|





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

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

|  | E     | χđ        | 10    | i ș   | Re             | Ba          | 2     | >     | Sb    | 2     |   | ſ          |          |
|--|-------|-----------|-------|-------|----------------|-------------|-------|-------|-------|-------|---|------------|----------|
|  |       | <002      | 20.02 | 0.01  | 100-           | 40.02       | 20.2  | 2     | 2002  | 20.02 |   |            |          |
|  |       | 2         | S     | 2     | ç              | ĉ           | Ę     | ? (   | ç     | 5     |   |            |          |
|  | 10.01 | 50        | <0.02 | 70.02 | 200            | <0.02       | 20.05 |       | 502   | <0.02 |   |            |          |
|  | 20    | <u>۸.</u> | ନ୍ଚ   | Ga    | ?              | ଜୁ          | E     | 1 [   | ų     | Dy    |   |            |          |
|  | 70.07 | <0.02     |       | 20.02 | 3              | <0.02       | 20.02 | 20.02 | 500   | <0.02 | The second se |            |          |
|  | 10    | P         | Ľ     | не    | 1              | 7           | In    | DIT.  | 5     | Hf    |   |            |          |
|  | 20.02 | 3         | A0.02 | <0.2  | 10101          | <b>2003</b> | <0.02 | 20.05 | 3     | <0.02 |   | 1 :        | TYPE Me  |
|  | ING   |           | Mo    | âн    |                | Ş           | Mg    | 74    | •     | 5     | Superior of   | , caio     | Apto lo  |
|  | 20.02 |           | A0.03 | <0.2  | 10.02          | 505         | <0.01 | <0.02 | 3     | <0.02 | WINDER HURST  | V CI IIICO | Varifics |
|  | Ĕ     | 1;        | Ş     | ď     | 2              | 2           | õ     | No    | í     | N     |   |            |          |
|  | 40.2  | 10.01     | 30    | <0.02 | 20.02          | 2           | <0.02 | 20.02 |       | 40.02 | 100 m 100 m   | by icr-    |          |
|  | Sc    |           | 2     | Ru    | 20             | 2           | R     | Re    |       | Ţ     |   | D CIM      | No 1     |
|  | <0.02 | 10.04     | 5     | <0.02 | 20.02          | 2           | <0.02 | <0.02 | 10101 | 3002  |   |            |          |
|  | Ta    | G         | 0     | Sr    | Na             | 5           | Ag    | S     | Ş     | 2     | And a state of the  |            |          |
|  | <0.02 | 20.05     | 3     | <0.02 | 202            |             | 40.03 | 40.02 | 10.4  | c (h  |   |            |          |
|  | E     | SII       | 2     | ī     | Ω.             |             | -     | Te    | 10    |       |   |            |          |
|  | 40.02 | 20.02     | 2     | 40.02 | <0.02          | Þ           | -1    | <0.02 | 70.02 | co c  | COLUMN TWO AND ADDRESS OF THE OWNER.  |            |          |
|  | 27    | 20        | 3     | ×     | Υ <sup>β</sup> | -           | <     | С     | 44    | W     |   |            |          |
|  | 40.02 | 40.02     |       | 40.02 | 40.02          | 10.02       | 3     | 40.02 | <0.02 | 2     |   |            |          |

(I) = Target analyte

# Physical Characterization:

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

Ser P. S.

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

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

\*^

| Absolute Standards, Inc.<br>800-368-1131<br>www.absolutestandards.com                    | CERTIFIED WEIGHT REPORT: | Part Number: 57023<br>Lot Number: 062424<br>Description: Vanadium (V) | Expiration Date: 062427 |      |                     | Volume shown below was diluted to (mL): 2000.3 | Part Lot Dilution  | Compound Number Number Factor | 1. Ammonium metavanadate (V) 58123 021224 0.1000 | [1] Spectrum No.1 [ 34.243<br>2.0E6   |  | m/z->- 10 20 | 2.067 | 1.067 | m/z 110 120 1 | 2.588 |      |
|--|--------------------------|---|-------------------------|------|---------------------|--|--|-------------------------------|--|---------------------------------------|--|--------------|-------|-------|---------------|-------|------|
| 8:81<br>Ce   |                          |   |                         |      | 5E-05               | 0.06   | Initial  |                               | 200.0  | sec]:58                               |  | 30           |       |       | 190           |       | 200  |
| Certified Reference Material CRM<br>冬」 シート   |                          |   |                         |      | Balance Uncertainty | Flask Uncertainty                              | Uncertainty  |                               | 0.084  | 34.243 sec]:58023.D# [Count] [Linear] |  | 4            |       |       | 140           |       | 240  |
| eference l   | Lot #                    | 24002546  | 2,0%                    |      | inty                |  | Nominal  | Conc. (µg/mL)                 | 1000   | žount) [Lin                           |  | 5<br>0       |       |       | -<br>50       |       | 2000 |
| Naterial Cl  | Solvent:                 | Nitric Acid   | 40.0<br>(mL)            |      |                     |  | Initial  | Conc. (µg/mL)                 | 10000.3  | 1⊖ar]                                 |  | 60           |       |       | 160           |       | 260  |
| <b>MF</b><br>M6021   |                          |   | Nitric Acid             |      |                     |  | Final  | Con                           | 1000.0   |                                       |  |              |       |       | j.            |       | •    |
| 21   |                          | Alla  | Formulated By:          | M    | Reviewed By:        |  | Expanded   |                               | 2.2  |                                       |  | 70           |       |       | 170           |       |      |
|  |                          | Alleah & Brack  | J By:                   | 2 l  | y:                  |  | (Solve)  |                               | 7803-55-6  |                                       |  | 80           |       |       | 180<br>0      |       |      |
| ht   |                          | Garan   | Aleah O'Brady           | ento | Pedro L. Rentas     |  | SDS Information<br>It Safety Info. On Atta                       | OSHA PEL (TWA)                | 0.05 mg/m3                                       |                                       |  | 90           |       |       | 190           |       |      |
| ANAB ISO 17034 Accredited<br>AR-1539 Certificate Number<br>https://Absolutestandards.com |                          |   | 062424                  | /    | s 062424            |  | <b>SDS Information</b><br>(Solvent Safety Info. On Attached pg.) | (A) LD50                      | 3 ort-rat 58.1mg/kg                              |                                       |  | 100          |       |       | 200           |       |      |
| Accreditec<br>te Numbe<br>dards.con  | 1                        |   | <u> </u>                |      |                     | ļ  | NIST   | SRM                           | 3165   |                                       |  |              |       |       |               |       |      |

1 of 2

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Lot # 062424

Part # 57023





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

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

|                |       |       | IG       | <u>.</u> | Be         | U4   | 5     | 202   | A =     | S      |          | ≥  |  |         |          |   |
|----------------|-------|-------|----------|----------|------------|--|-------|-------|---------|--------|----------|--|--|---------|----------|---|
|                |       | 93    | 20.05    | 3        | <u>0</u> 0 | 20.02  | 3     | 202   | 5       | A0.02  |          | 40.02  |  |         |          |   |
|                |       | 2     | S        | )<br>    | ፍ          | ç  | ?     | 5     | >       | ي<br>۵ | 1        | 5  |  |         |          |   |
|                | areas | 3     | 20.02    |          | <0.02      | 20.05  | 2     | 20.02 | 2       | 4012   | 10100    | ann  | and the second se  |         |          |   |
|                | 200   | Ån    | ç        |          | <u></u>    | ç  | 2     | 13    | ' 1     | 막      | 5        | ٦ <b>.</b> .   |  |         |          |   |
|                | 70.02 | 3     | <0.02    |          | 303        | 20.02  | 2     | A0.02 |         | 2002   | 10.04    | con  |  |         |          |   |
|                | 1 50  | ģ     | 5        |          | ţ,         | q  | •     | þ     |         | H      | m        | 5  | Cardinal and   |         |          |   |
|                | 20.02 | 3     | A0.02    | 1.01     | 2          | 40.02  | 2     | A.02  | -01-01- | 33     | 20.02    | 200  | Contraction of the local division of the loc |         | Trace M  |   |
|                | Na    |       | Mo       | 28       | Ş          | Mn   | 6     | Ma    | Ę       |        | L        | T  | Contraction of the local distance of the loc |         | etals    | • |
| (T) = Targ     | 20.02 | 2     | 40.02    | 202      | Ś          | 40.02  |       | 2001  | 70.02   | 55     | 20.02    | 222  | SCHOOL STOR  |         | Verifica |   |
| Target analyte | ŗ     | :     | 7        | ٦        | 3          | Pd   | ;     | ò     | UNI     | ł      | N        |  | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  |         | tion     |   |
| e              | 40.2  |       | 40.02    | 20.02    | 2          | <b>A</b> 22  | 10100 | 403   | 20.05   | 5      | 40.02    |  | のないのであるので  | 101     |          |   |
|                | Sc    | i     | Sm       | Ku       | ,          | Rb   | 1111  | Ŗ     | Xe      | 3      | 19       |  |  |         |          |   |
|                | 40.02 |       | 33       | <0.02    |            | 40.02  | 10.06 | 33    | 20.02   | 3      | <0.02    | and the second se  |  | / min_/ |          |   |
|                | Ta    | <     | <i>^</i> | St       |            | z  | 26    | A.    | Ľ       | ;      | Ş        |  |  |         |          |   |
|                | <0.02 | 10.01 | 3        | 40.02    |            | <n.2< td=""><td>70.02</td><td>3</td><td>&lt;0.02</td><td></td><td>40.2</td><td>and the second se</td><td></td><td></td><td></td><td></td></n.2<> | 70.02 | 3     | <0.02   |        | 40.2     | and the second se  |  |         |          |   |
|                | П     | QH    | ç        | Tm       |            | ł  | 11    | ł     | Te      | 3      | Ţ        |  |  |         |          |   |
|                | <0.02 | 20.02 | 3        | <0.02    | 10.04      | 33   | 20:05 | 2     | 40.02   | 10101  | 2003     |  |  |         |          |   |
|                | Zr    | 211   | 1        | ¥        | , L        | ş  | <     |       | q       | :      | W        | A DESCRIPTION OF   |  |         |          |   |
|                | <0.02 | 20.02 | 3        | 40.02    | 70.07      | 3  | -     | 3     | 40.02   | 20.02  | Solution | A DESCRIPTION OF THE PARTY OF T |  |         |          |   |

# Physical Characterization:

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

In P. Sur

Certified by:

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

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

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

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