

## Prep Standard - Chemical Standard Summary

**Order ID :** P5192

**Test :** Mercury, Metals ICP-Group

**Prepbatch ID :** PB165519, PB165738,

**Sequence ID/Qc Batch ID:** LB133852, LB134054, LB134054,

**Standard ID :**

MP83105, MP835337, MP83534, MP83535, MP83536, MP83538, MP83540, MP83541, MP83542, MP83543, MP83544, MP83545, MP83546, MP83548,

**Chemical ID :**

M5062, M5882, M5953, M6000, M6009, M6111, M6121, M6126, W3112,

## Metals STANDARD PREPARATION LOG

| <u>Recipe ID</u> | <u>NAME</u> | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u> | <u>Supervised By</u> |
|------------------|-------------|-------------------------|------------------|------------------------|--------------------|----------------|------------------|----------------------|
| 170              | 1:1HCL      | <a href="#">MP83105</a> | 11/07/2024       | 12/27/2024             | Janvi Patel        | None           | None             | Sarabjit Jaswal      |
|                  |             |                         |                  |                        |                    |                |                  | 11/07/2024           |

**FROM** 1000.00000ml of M6111 + 1000.00000ml of W3112 = Final Quantity: 2000.000 ml

| <u>Recipe ID</u> | <u>NAME</u>     | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>       | <u>Supervised By</u> |
|------------------|-----------------|-------------------------|------------------|------------------------|--------------------|----------------|------------------------|----------------------|
| 1340             | Hg 0.00 PPB STD | <a href="#">MP83534</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HGA) | Sarabjit Jaswal      |
|                  |                 |                         |                  |                        |                    |                |                        | 12/10/2024           |

**FROM** 2.50000ml of M6126 + 247.50000ml of W3112 = Final Quantity: 250.000 ml



| <u>Recipe ID</u>                                                                                                 | <u>NAME</u> | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>      | <u>Supervised By</u> |
|------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|------------------|------------------------|--------------------|----------------|-----------------------|----------------------|
| 2750                                                                                                             | Hg 0.05ppb  | <a href="#">MP83535</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HG) | Sarabjit Jaswal      |
| <p><b>FROM</b> 2.50000ml of M6126 + 247.45000ml of W3112 + 0.05000ml of MP83533 = Final Quantity: 250.000 ml</p> |             |                         |                  |                        |                    |                |                       |                      |

| <u>Recipe ID</u> | <u>NAME</u>                                                                                   | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>        | <u>Supervised By</u>          |
|------------------|-----------------------------------------------------------------------------------------------|-------------------------|------------------|------------------------|--------------------|----------------|-------------------------|-------------------------------|
| 1341             | Hg 0.2 PPB STD                                                                                | <a href="#">MP83536</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HG A) | Sarabjit Jaswal<br>12/10/2024 |
| <u>FROM</u>      | 2.50000ml of M6126 + 247.30000ml of W3112 + 0.20000ml of MP83533 = Final Quantity: 250.000 ml |                         |                  |                        |                    |                |                         |                               |



| <u>Recipe ID</u> | <u>NAME</u>                                                                                   | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>        | <u>Supervised By</u>          |
|------------------|-----------------------------------------------------------------------------------------------|-------------------------|------------------|------------------------|--------------------|----------------|-------------------------|-------------------------------|
| 1343             | Hg 5.0 PPB STD                                                                                | <a href="#">MP83538</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HG A) | Sarabjit Jaswal<br>12/10/2024 |
| <u>FROM</u>      | 2.50000ml of M6126 + 242.50000ml of W3112 + 5.00000ml of MP83533 = Final Quantity: 250.000 ml |                         |                  |                        |                    |                |                         |                               |

| <u>Recipe ID</u>                                                                                                  | <u>NAME</u>     | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>      | <u>Supervised By</u> |
|-------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------|------------------|------------------------|--------------------|----------------|-----------------------|----------------------|
| 1345                                                                                                              | Hg 10.0 PPB STD | <a href="#">MP83540</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HG) | Sarabjit Jaswal      |
| <p><b>FROM</b> 2.50000ml of M6126 + 237.50000ml of W3112 + 10.00000ml of MP83533 = Final Quantity: 250.000 ml</p> |                 |                         |                  |                        |                    |                |                       |                      |



| <u>Recipe ID</u>                                                                                            | <u>NAME</u>     | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>      | <u>Supervised By</u>          |
|-------------------------------------------------------------------------------------------------------------|-----------------|-------------------------|------------------|------------------------|--------------------|----------------|-----------------------|-------------------------------|
| 1346                                                                                                        | Hg ICV SOLUTION | <a href="#">MP83541</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HG) | Sarabjit Jaswal<br>12/10/2024 |
| <b>FROM</b> 2.50000ml of M5953 + 2.50000ml of M6126 + 245.00000ml of W3112 = Final Quantity: 250.000 ml<br> |                 |                         |                  |                        |                    |                |                       |                               |

| <u>Recipe ID</u> | <u>NAME</u>                                                            | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>       | <u>Supervised By</u>          |
|------------------|------------------------------------------------------------------------|-------------------------|------------------|------------------------|--------------------|----------------|------------------------|-------------------------------|
| 1351             | ICB (Hg 0.00 PPB SOLUTION)                                             | <a href="#">MP83542</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HGA) | Sarabjit Jaswal<br>12/10/2024 |
| <u>FROM</u>      | 2.50000ml of M6126 + 247.50000ml of W3112 = Final Quantity: 250.000 ml |                         |                  |                        |                    |                |                        |                               |



| <u>Recipe ID</u> | <u>NAME</u>                                                                                    | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>        | <u>Supervised By</u>          |
|------------------|------------------------------------------------------------------------------------------------|-------------------------|------------------|------------------------|--------------------|----------------|-------------------------|-------------------------------|
| 1358             | CCV (Hg 5.0 PPB SOLUTION)                                                                      | <a href="#">MP83543</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HG A) | Sarabjit Jaswal<br>12/10/2024 |
| <u>FROM</u>      | 485.00000ml of W3112 + 5.00000ml of M6126 + 10.00000ml of MP83533 = Final Quantity: 500.000 ml |                         |                  |                        |                    |                |                         |                               |

| <u>Recipe ID</u>                                                                          | <u>NAME</u>                | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>        | <u>Supervised By</u>          |
|-------------------------------------------------------------------------------------------|----------------------------|-------------------------|------------------|------------------------|--------------------|----------------|-------------------------|-------------------------------|
| 1352                                                                                      | CCB (Hg 0.00 PPB SOLUTION) | <a href="#">MP83544</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HG A) | Sarabjit Jaswal<br>12/10/2024 |
| <b><u>FROM</u></b> 495.00000ml of W3112 + 5.00000ml of M6126 = Final Quantity: 500.000 ml |                            |                         |                  |                        |                    |                |                         |                               |



| <u>Recipe ID</u> | <u>NAME</u>                                                                                   | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>       | <u>Supervised By</u>          |
|------------------|-----------------------------------------------------------------------------------------------|-------------------------|------------------|------------------------|--------------------|----------------|------------------------|-------------------------------|
| 1349             | CRA/CRI (Hg 0.2 PPB SOLUTION)                                                                 | <a href="#">MP83545</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HGA) | Sarabjit Jaswal<br>12/10/2024 |
| <u>FROM</u>      | 2.50000ml of M6126 + 247.30000ml of W3112 + 0.20000ml of MP83533 = Final Quantity: 250.000 ml |                         |                  |                        |                    |                |                        |                               |

| <u>Recipe ID</u> | <u>NAME</u>                                                                                   | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u> | <u>PipetteID</u>       | <u>Supervised By</u>          |
|------------------|-----------------------------------------------------------------------------------------------|-------------------------|------------------|------------------------|--------------------|----------------|------------------------|-------------------------------|
| 1350             | CHK STD (Hg 7.0 PPB SOLUTION)                                                                 | <a href="#">MP83546</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | None           | METALS_PIPETTE_5 (HGA) | Sarabjit Jaswal<br>12/10/2024 |
| <u>FROM</u>      | 2.50000ml of M6126 + 240.50000ml of W3112 + 7.00000ml of MP83533 = Final Quantity: 250.000 ml |                         |                  |                        |                    |                |                        |                               |

## Metals STANDARD PREPARATION LOG

| <u>Recipe ID</u> | <u>NAME</u>                                                                                     | <u>NO.</u>              | <u>Prep Date</u> | <u>Expiration Date</u> | <u>Prepared By</u> | <u>ScaleID</u>          | <u>PipetteID</u> | <u>Supervised By</u>          |
|------------------|-------------------------------------------------------------------------------------------------|-------------------------|------------------|------------------------|--------------------|-------------------------|------------------|-------------------------------|
| 68               | STANNOUS CHLORIDE SOLUTION                                                                      | <a href="#">MP83548</a> | 12/10/2024       | 12/11/2024             | Mohan Bera         | METALS_SCALE_3 (M SC-3) | None             | Sarabjit Jaswal<br>12/10/2024 |
| <u>FROM</u>      | 450.00000ml of W3112 + 50.00000gram of M5882 + 50.00000ml of M6121 = Final Quantity: 500.000 ml |                         |                  |                        |                    |                         |                  |                               |



## CHEMICAL RECEIPT LOG BOOK

| Supplier           | ItemCode / ItemName                    | Lot #       | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|--------------------|----------------------------------------|-------------|-----------------|-------------------------|-----------------------------|----------------|
| Inorganic Ventures | MSHG-10PPM / MERCURY HCl 125mL 10ug/mL | S2-HG709270 | 09/22/2026      | 05/28/2022 / mohan      | 01/27/2022 / mohan          | M5062          |

| Supplier         | ItemCode / ItemName                        | Lot #  | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|------------------|--------------------------------------------|--------|-----------------|-------------------------|-----------------------------|----------------|
| Seidler Chemical | BA-3980-01 / Stannous Chloride (cs/4x500g) | 232820 | 08/31/2028      | 04/30/2024 / mohan      | 04/25/2024 / mohan          | M5882          |

| Supplier | ItemCode / ItemName           | Lot #     | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|----------|-------------------------------|-----------|-----------------|-------------------------|-----------------------------|----------------|
| EPA      | ICV-5 / ICV ( HG ) STOCK SOLN | ICV5-0415 | 01/01/2025      | 07/01/2024 / mohan      | 03/30/2023 / mohan          | M5953          |

| Supplier           | ItemCode / ItemName                                      | Lot #        | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|--------------------|----------------------------------------------------------|--------------|-----------------|-------------------------|-----------------------------|----------------|
| Inorganic Ventures | WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml | T2-MEB723367 | 08/30/2026      | 08/13/2024 / Jaswal     | 05/14/2024 / Jaswal         | M6000          |

| Supplier           | ItemCode / ItemName                                      | Lot #        | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|--------------------|----------------------------------------------------------|--------------|-----------------|-------------------------|-----------------------------|----------------|
| Inorganic Ventures | WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml | U2-MEB731108 | 03/17/2028      | 08/13/2024 / Jaswal     | 05/14/2024 / Jaswal         | M6009          |

| Supplier         | ItemCode / ItemName                                         | Lot #      | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|------------------|-------------------------------------------------------------|------------|-----------------|-------------------------|-----------------------------|----------------|
| Seidler Chemical | BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L) | 22F0762009 | 05/09/2027      | 11/04/2024 / Eman       | 09/29/2024 / Janvi          | M6111          |

### CHEMICAL RECEIPT LOG BOOK

| Supplier         | ItemCode / ItemName                                         | Lot #      | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|------------------|-------------------------------------------------------------|------------|-----------------|-------------------------|-----------------------------|----------------|
| Seidler Chemical | BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L) | 0000275677 | 05/13/2025      | 11/13/2024 / Eman       | 10/13/2024 / Eman           | M6121          |

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

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

M5882  
 M3

## 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 – 0120633

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

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

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



Harout Sahagian - Quality Control Supervisor - Fair Lawn

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.



Refine your results. Redefine your industry.

RD:05/14/2024

# Certificate of Analysis

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## 1.0 ACCREDITATION / REGISTRATION

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



## 2.0 PRODUCT DESCRIPTION

|                 |                                     |
|-----------------|-------------------------------------|
| Product Code:   | Multi Analyte Custom Grade Solution |
| Catalog Number: | WW-LFS-1                            |
| Lot Number:     | T2-MEB723367                        |
| Matrix:         | 5% (v/v) HNO <sub>3</sub>           |

|                     |                 |            |
|---------------------|-----------------|------------|
| Value / Analyte(s): | 1 000 µg/mL ea: |            |
|                     | Potassium,      |            |
|                     | 600 µg/mL ea:   |            |
|                     | Phosphorus,     |            |
|                     | 300 µg/mL ea:   |            |
|                     | Sodium,         | Iron,      |
|                     | 200 µg/mL ea:   |            |
|                     | Magnesium,      | Aluminum,  |
|                     | Cerium,         | Selenium,  |
|                     | Thallium,       |            |
|                     | 100 µg/mL ea:   |            |
|                     | Lead,           | Calcium,   |
|                     | 80 µg/mL ea:    |            |
|                     | Arsenic,        |            |
|                     | 70 µg/mL ea:    |            |
|                     | Mercury,        |            |
|                     | 50 µg/mL ea:    |            |
|                     | Nickel,         |            |
|                     | 40 µg/mL ea:    |            |
|                     | Chromium,       |            |
|                     | 30 µg/mL ea:    |            |
|                     | Copper,         | Boron,     |
|                     | Vanadium,       |            |
|                     | 20 µg/mL ea:    |            |
|                     | Zinc,           | Strontium, |
|                     | Barium,         | Beryllium, |
|                     | Cadmium,        | Cobalt,    |
|                     | Manganese,      | Lithium,   |
|                     | 7.5 µg/mL ea:   |            |
|                     | Silver          |            |

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

**Density:** 1.034 g/mL (measured at 20 ± 4 °C)

**Assay Information:**

| <b>ANALYTE</b> | <b>METHOD</b> | <b>NIST SRM#</b>   | <b>SRM LOT#</b> |
|----------------|---------------|--------------------|-----------------|
| Ag             | ICP Assay     | 3151               | 160729          |
| Ag             | Volhard       | 999c               | 999c            |
| Ag             | Calculated    |                    | See Sec. 4.2    |
| Al             | ICP Assay     | 3101a              | 140903          |
| Al             | EDTA          | 928                | 928             |
| As             | ICP Assay     | 3103a              | 100818          |
| B              | ICP Assay     | 3107               | 190605          |
| Ba             | ICP Assay     | 3104a              | 140909          |
| Ba             | Gravimetric   |                    | See Sec. 4.2    |
| Be             | ICP Assay     | 3105a              | 090514          |
| Ca             | ICP Assay     | 3109a              | 130213          |
| Ca             | EDTA          | 928                | 928             |
| Cd             | ICP Assay     | 3108               | 130116          |
| Cd             | EDTA          | 928                | 928             |
| Ce             | ICP Assay     | 3110               | 090504          |
| Ce             | 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             |
| Hg             | ICP Assay     | 3133               | 160921          |
| Hg             | EDTA          | 928                | 928             |
| K              | ICP Assay     | 3141a              | 140813          |
| K              | Gravimetric   |                    | See Sec. 4.2    |
| Li             | ICP Assay     | 3129a              | 100714          |
| Li             | Gravimetric   |                    | See Sec. 4.2    |
| Mg             | ICP Assay     | 3131a              | 140110          |
| Mg             | EDTA          | 928                | 928             |
| Mn             | ICP Assay     | 3132               | 050429          |
| Mn             | EDTA          | 928                | 928             |
| Na             | ICP Assay     | Traceable to 3152A | S2-NA700842     |
| Na             | Gravimetric   |                    | See Sec. 4.2    |
| Ni             | ICP Assay     | 3136               | 120619          |
| Ni             | EDTA          | 928                | 928             |
| P              | ICP Assay     | 3139a              | 060717          |
| P              | Acidimetric   | 84L                | 84L             |
| Pb             | ICP Assay     | 3128               | 101026          |
| Pb             | EDTA          | 928                | 928             |
| Se             | ICP Assay     | 3149               | 100901          |
| Sr             | EDTA          | 928                | 928             |
| Sr             | ICP Assay     | Traceable to 3153a | K2-SR650985     |
| Tl             | ICP Assay     | 3158               | 151215          |
| V              | IC Assay      | 3165               | 160906          |
| V              | EDTA          | 928                | 928             |
| Zn             | ICP Assay     | 3168a              | 120629          |
| Zn             | EDTA          | 928                | 928             |

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

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

Certified Value,  $X_{\text{CRM/RM}}$ , where two or more methods of characterization are used is the weighted mean of the results:

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

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

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

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

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

$k$  = coverage factor = 2

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

$u_{\text{bb}}$  = bottle to bottle homogeneity standard uncertainty

$u_{\text{ts}}$  = long term stability standard uncertainty (storage)

$u_{\text{ts}}$  = transport stability standard uncertainty

#### Characterization of CRM/RM by One Method

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

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

$X_a$  = mean of Assay Method A with

$u_{\text{char } a}$  = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty (z)} = U_{\text{CRM/RM}} = k (u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{ts}}^2 + u_{\text{ts}}^2)^{1/2}$$

$k$  = coverage factor = 2

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

$u_{\text{bb}}$  = bottle to bottle homogeneity standard uncertainty

$u_{\text{ts}}$  = long term stability standard uncertainty (storage)

$u_{\text{ts}}$  = transport stability standard uncertainty

## 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/A

## 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

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

- For more information, visit [www.inorganicventures.com/TCT](http://www.inorganicventures.com/TCT)

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



## 8.0 HAZARDOUS INFORMATION

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

## 9.0 HOMOGENEITY

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

## 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; [info@inorganicventures.com](mailto:info@inorganicventures.com); [inorganicventures.com](http://inorganicventures.com)

## 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### 11.1 Certification Issue Date

August 30, 2022

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

### 11.2 Lot Expiration Date

- August 30, 2026

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

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

### 11.3 Period of Validity

- Sealed TCT Bag Open Date: \_\_\_\_\_

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

## 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Thomas Kozikowski  
Manager, Quality Control



### Certifying Officer:

Paul Gaines  
Chairman / Senior Technical Director





Refine your results. Redefine your industry.

RD:05/14/2024

# 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: WW-LFS-2  
Lot Number: U2-MEB731108  
Matrix: 5% (v/v) HNO<sub>3</sub>  
tr. HF  
Value / Analyte(s):  
200 µg/mL ea:  
Silica,  
80 µg/mL ea:  
Antimony,  
70 µg/mL ea:  
Tin,  
40 µg/mL ea:  
Molybdenum,  
20 µg/mL ea:  
Titanium

## 3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE                  | CERTIFIED VALUE    | ANALYTE        | CERTIFIED VALUE    |
|--------------------------|--------------------|----------------|--------------------|
| Antimony, Sb             | 80.1 ± 0.6 µg/mL   | Molybdenum, Mo | 40.03 ± 0.18 µg/mL |
| Silica, SiO <sub>2</sub> | 200.2 ± 1.3 µg/mL  | Tin, Sn        | 70.0 ± 0.4 µg/mL   |
| Titanium, Ti             | 20.01 ± 0.13 µg/mL |                |                    |

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

### Assay Information:

| ANALYTE          | METHOD     | NIST SRM# | SRM LOT#     |
|------------------|------------|-----------|--------------|
| Mo               | ICP Assay  | 3134      | 130418       |
| Mo               | Calculated |           | See Sec. 4.2 |
| Sb               | ICP Assay  | 3102a     | 140911       |
| SiO <sub>2</sub> | ICP Assay  | 3150      | 130912       |
| Sn               | ICP Assay  | 3161a     | 140917       |
| Ti               | ICP Assay  | 3162a     | 130925       |
| Ti               | Calculated |           | See Sec. 4.2 |

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

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

Certified Value,  $X_{\text{CRM/RM}}$ , where two or more methods of characterization are used is the weighted mean of the results:

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

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

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

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

$$\text{CRM/RM Expanded Uncertainty } (z) = U_{\text{CRM/RM}} = k (u_{\text{char}}^2 + u_{\text{bb}}^2 + u_{\text{ITS}}^2 + u_{\text{TS}}^2)^{1/2}$$

$k$  = coverage factor = 2

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

$u_{\text{bb}}$  = bottle to bottle homogeneity standard uncertainty

$u_{\text{ITS}}$  = long term stability standard uncertainty (storage)

$u_{\text{TS}}$  = transport stability standard uncertainty

#### Characterization of CRM/RM by One Method

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

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

$X_a$  = mean of Assay Method A with

$u_{\text{char } a}$  = the standard uncertainty of characterization Method A

$$\text{CRM/RM Expanded Uncertainty } (z) = U_{\text{CRM/RM}} = k (u_{\text{char } a}^2 + u_{\text{bb}}^2 + u_{\text{ITS}}^2 + u_{\text{TS}}^2)^{1/2}$$

$k$  = coverage factor = 2

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

$u_{\text{bb}}$  = bottle to bottle homogeneity standard uncertainty

$u_{\text{ITS}}$  = long term stability standard uncertainty (storage)

$u_{\text{TS}}$  = transport stability standard uncertainty

## 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/A

## 6.0 INTENDED USE

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

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

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

### 7.1 Storage and Handling Recommendations

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

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

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 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](http://www.inorganicventures.com/TCT)

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

## **8.0 HAZARDOUS INFORMATION**

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

## **9.0 HOMOGENEITY**

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

## **10.0 QUALITY STANDARD DOCUMENTATION**

### **10.1 ISO 9001 Quality Management System Registration**

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

### **11.1 Certification Issue Date**

March 17, 2023

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

### **11.2 Lot Expiration Date**

- **March 17, 2028**

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

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

### 11.3 Period of Validity

- Sealed TCT Bag Open Date: \_\_\_\_\_

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

#### Certificate Approved By:

Thomas Kozikowski  
Manager, Quality Control



#### Certifying Officer:

Paul Gaines  
Chairman / Senior Technical Director



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info@inorganicventures.com

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## 1.0 ACCREDITATION / REGISTRATION

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



## 2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Mass Spec Solution  
Catalog Number: MSHG-10PPM  
Lot Number: S2-HG709270  
Matrix: 10% (v/v) HCl  
Value / Analyte(s): 10 µg/mL ea:  
Mercury  
Starting Material: Hg metal  
Starting Material Lot#: 1959  
Starting Material Purity: 99.9994%

## 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 10.001 ± 0.053 µg/mL  
**Density:** 1.020 g/mL (measured at 20 ± 4 °C)

### Assay Information:

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

Certified Value,  $X_{CRM/RM}$ , where two or more methods of characterization are used is the weighted mean of the results:

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

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

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

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

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

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

$u_{bb}$  = bottle to bottle homogeneity standard uncertainty

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

$u_{ts}$  = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

$X_a$  = mean of Assay Method A with

$u_{char a}$  = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

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

$u_{bb}$  = bottle to bottle homogeneity standard uncertainty

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

$u_{ts}$  = transport stability standard uncertainty

## 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

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

## 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

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

- For more information, visit [www.inorganicventures.com/TCT](http://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 HNO<sub>3</sub>. 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% HNO<sub>3</sub> / LDPE container, stable in 10% HNO<sub>3</sub> packaged in borosilicate glass. 1-100 ppm levels stable in 7% HNO<sub>3</sub> packaged in borosilicate glass. 1000-10,000 ppm solutions are chemically stable for years in 5-10% HNO<sub>3</sub> / LDPE container.

**Hg Containing Samples (Preparation and Solution)** - Metal (soluble in HNO<sub>3</sub>); Oxide (Soluble in HNO<sub>3</sub>); Ores and Organic based (The literature has more references to the preparation of Hg containing samples than any other element. Please consult the literature for your specific sample type, since such preparations are prone to error. Or e-mail our technical staff and we will contact you to discuss your particular sample preparation questions in further detail.).

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

| Technique/Line     | Estimated D.L.     | Order | Interferences (underlined indicates severe) |
|--------------------|--------------------|-------|---------------------------------------------|
| ICP-MS 202 amu     | 9 ppt              | n/a   | 186W16O                                     |
| ICP-OES 184.950 nm | 0.03 / 0.005 µg/mL | 1     |                                             |
| ICP-OES 194.227 nm | 0.03 / 0.005 µg/mL | 1     | V                                           |
| ICP-OES 253.652 nm | 0.1 / 0.03 µg/mL   | 1     | Ta, Co, Th ,Rh , Fe,<br>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

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## 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



### Certificate Approved By:

Michael Booth  
Director, Quality Control



### Certifying Officer:

Paul Gaines  
Chairman / Senior Technical Director





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

Instructions for QATS Reference Material: *Inorganic ICV Solutions*

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

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

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

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



M5528-32  
M5953  
3/30/23

(A) **SAMPLE DESCRIPTION**

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

(B) **BREAKAGE OR MISSING ITEMS**

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

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

(C) **ANALYSIS OF SAMPLES**

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

**ICV1-1014** For ICP-AES analysis, use a 10-fold dilution by pipetting 10 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.





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

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

**ICV1-1014**

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

**ICV5-0415**

For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v)  $K_2Cr_2O_7$  and 5% (v/v) nitric acid.

**ICV6-0400**

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from  $K_3Fe(CN)_6$ , Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

| 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                                            | 100                                              |
| Cr        | 520                                              | 2000                                             |
| Co        | 520                                              | 100                                              |
| Cu        | 510                                              | 100                                              |
| Fe        | 10000                                            | 100                                              |
| Pb        | 1000                                             | 2000                                             |
| Mg        | 6000                                             | 200                                              |
| Mn        | 520                                              | 1200                                             |
| Ni        | 530                                              | 100                                              |
| K         | 9900                                             | 110                                              |
| Se        | 1000                                             | 2000                                             |
| Ag        | 250                                              | 200                                              |
| Na        | 10000                                            | 50                                               |
| Tl        | 1000                                             | 2000                                             |
| V         | 500                                              | 210                                              |
| Zn        | 1000                                             | 100                                              |
|           |                                                  | 200                                              |

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

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

Receive date  
9/29/24  
Met diag.

 avantor™



Material No.: 9530-33  
Batch No.: 22F0762009  
Manufactured Date: 2022-05-10  
Retest Date: 2027-05-09  
Revision No.: 0

M6109  
M6110  
M6111

## Certificate of Analysis

| Test                                      | Specification | Result      |
|-------------------------------------------|---------------|-------------|
| ACS – Assay (as HCl) (by acid–base titrn) | 36.5 – 38.0 % | 37.6 %      |
| ACS – Color (APHA)                        | ≤ 10          | 5           |
| ACS – Residue after Ignition              | ≤ 3 ppm       | < 1 ppm     |
| ACS – Specific Gravity at 60°/60°F        | 1.185 – 1.192 | 1.190       |
| ACS – Bromide (Br)                        | ≤ 0.005 %     | < 0.005 %   |
| ACS – Extractable Organic Substances      | ≤ 5 ppm       | < 1 ppm     |
| ACS – Free Chlorine (as Cl <sub>2</sub> ) | ≤ 0.5 ppm     | < 0.5 ppm   |
| Phosphate (PO <sub>4</sub> )              | ≤ 0.05 ppm    | < 0.03 ppm  |
| Sulfate (SO <sub>4</sub> )                | ≤ 0.5 ppm     | < 0.3 ppm   |
| Sulfite (SO <sub>3</sub> )                | ≤ 0.8 ppm     | 0.3 ppm     |
| Ammonium (NH <sub>4</sub> )               | ≤ 3 ppm       | < 1 ppm     |
| Trace Impurities – Arsenic (As)           | ≤ 0.010 ppm   | < 0.003 ppm |
| Trace Impurities – Aluminum (Al)          | ≤ 10.0 ppb    | 0.8 ppb     |
| Arsenic and Antimony (as As)              | ≤ 5.0 ppb     | < 3.0 ppb   |
| Trace Impurities – Barium (Ba)            | ≤ 1.0 ppb     | < 0.2 ppb   |
| Trace Impurities – Beryllium (Be)         | ≤ 1.0 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    | 14.9 ppb    |
| Trace Impurities – Chromium (Cr)          | ≤ 1.0 ppb     | < 0.4 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     | 0.2 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.: 22F0762009

| 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    | 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 – 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     | < 0.2 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   | 1.0 ppb   |
| Trace Impurities – Silver (Ag)                         | ≤ 1.0 ppb     | < 0.3 ppb |
| Trace Impurities – Sodium (Na)                         | ≤ 100.0 ppb   | 0.7 ppb   |
| Trace Impurities – Strontium (Sr)                      | ≤ 1.0 ppb     | < 0.2 ppb |
| Trace Impurities – Tantalum (Ta)                       | ≤ 1.0 ppb     | < 0.9 ppb |
| Trace Impurities – Thallium (Tl)                       | ≤ 5.0 ppb     | < 2.0 ppb |
| Trace Impurities – Tin (Sn)                            | ≤ 5.0 ppb     | < 0.8 ppb |
| Trace Impurities – Titanium (Ti)                       | ≤ 1.0 ppb     | 0.2 ppb   |
| Trace Impurities – Vanadium (V)                        | ≤ 1.0 ppb     | < 0.2 ppb |
| Trace Impurities – Zinc (Zn)                           | ≤ 5.0 ppb     | 0.8 ppb   |
| Trace Impurities – Zirconium (Zr)                      | ≤ 1.0 ppb     | < 0.1 ppb |

>>> Continued on page 3 >>>

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

 **avantor™**

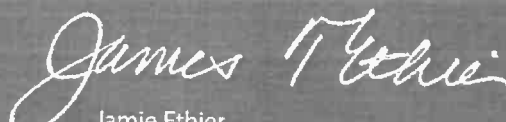


Material No.: 9530-33  
Batch No.: 22F0762009

| 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

  
Jamie Ethier  
Vice President Global Quality

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

avantor™



R → 16/13/24  
Met dig

M 6121

Material No.: 9530-33  
Batch No.: 0000275677  
Manufactured Date: 2020/12/16  
Retest Date: 2025/12/15  
Revision No: 1

## Certificate of Analysis

| Test                                      | Specification | Result  |
|-------------------------------------------|---------------|---------|
| ACS - Assay (as HCl) (by acid-base titrn) | 36.5 - 38.0 % | 37.6    |
| ACS - Color (APHA)                        | <= 10         | 5       |
| ACS - Residue after Ignition              | <= 3 ppm      | 1       |
| ACS - Specific Gravity at 60°/60°F        | 1.185 - 1.192 | 1.190   |
| ACS - Bromide (Br)                        | <= 0.005 %    | < 0.005 |
| ACS - Extractable Organic Substances      | <= 5 ppm      | 1       |
| ACS - Free Chlorine (as Cl <sub>2</sub> ) | <= 0.5 ppm    | < 0.5   |
| Phosphate (PO <sub>4</sub> )              | <= 0.05 ppm   | < 0.03  |
| Sulfate (SO <sub>4</sub> )                | <= 0.5 ppm    | < 0.3   |
| Sulfite (SO <sub>3</sub> )                | <= 0.8 ppm    | 0.3     |
| Ammonium (NH <sub>4</sub> )               | <= 3 ppm      | < 1     |
| Trace Impurities - Arsenic (As)           | <= 0.010 ppm  | < 0.003 |
| Trace Impurities - Aluminum (Al)          | <= 10.0 ppb   | < 0.2   |
| Arsenic and Antimony (as As)              | <= 5 ppb      | < 3     |
| Trace Impurities - Barium (Ba)            | <= 1.0 ppb    | < 0.2   |
| Trace Impurities - Beryllium (Be)         | <= 1.0 ppb    | < 0.2   |
| Trace Impurities - Bismuth (Bi)           | <= 10.0 ppb   | < 1.0   |
| Trace Impurities - Boron (B)              | <= 20.0 ppb   | < 5.0   |
| Trace Impurities - Cadmium (Cd)           | <= 1.0 ppb    | < 0.3   |
| Trace Impurities - Calcium (Ca)           | <= 50.0 ppb   | 29.7    |
| Trace Impurities - Chromium (Cr)          | <= 1.0 ppb    | < 0.4   |
| Trace Impurities - Cobalt (Co)            | <= 1.0 ppb    | < 0.3   |
| Trace Impurities - Copper (Cu)            | <= 1.0 ppb    | < 0.1   |
| Trace Impurities - Gallium (Ga)           | <= 1.0 ppb    | < 0.2   |

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

Material No.: 9530-33  
Batch No.: 0000275677

| Test                                                   | Specification | Result |
|--------------------------------------------------------|---------------|--------|
| Trace Impurities – Germanium (Ge)                      | <= 3.0 ppb    | < 2.0  |
| Trace Impurities – Gold (Au)                           | <= 4.0 ppb    | < 0.2  |
| Heavy Metals (as Pb)                                   | <= 100 ppb    | < 50   |
| Trace Impurities – Iron (Fe)                           | <= 15.0 ppb   | < 1    |
| Trace Impurities – Lead (Pb)                           | <= 1.0 ppb    | < 0.5  |
| Trace Impurities – Lithium (Li)                        | <= 1.0 ppb    | 0.2    |
| Trace Impurities – Magnesium (Mg)                      | <= 10.0 ppb   | 0.4    |
| Trace Impurities – Manganese (Mn)                      | <= 1.0 ppb    | < 0.4  |
| Trace Impurities – Mercury (Hg)                        | <= 0.5 ppb    | 0.1    |
| Trace Impurities – Molybdenum (Mo)                     | <= 10.0 ppb   | < 5.0  |
| Trace Impurities – Nickel (Ni)                         | <= 4.0 ppb    | < 0.3  |
| Trace Impurities – Niobium (Nb)                        | <= 1.0 ppb    | < 0.2  |
| Trace Impurities – Potassium (K)                       | <= 9.0 ppb    | < 2.0  |
| Trace Impurities – Selenium (Se), For Information Only | ppb           | 1.0    |
| Trace Impurities – Silicon (Si)                        | <= 100.0 ppb  | < 10.0 |
| Trace Impurities – Silver (Ag)                         | <= 1.0 ppb    | < 0.3  |
| Trace Impurities – Sodium (Na)                         | <= 100.0 ppb  | < 5.0  |
| Trace Impurities – Strontium (Sr)                      | <= 1.0 ppb    | < 0.2  |
| Trace Impurities – Tantalum (Ta)                       | <= 1.0 ppb    | < 0.9  |
| Trace Impurities – Thallium (Tl)                       | <= 5.0 ppb    | < 2.0  |
| Trace Impurities – Tin (Sn)                            | <= 5.0 ppb    | < 0.8  |
| Trace Impurities – Titanium (Ti)                       | <= 1.0 ppb    | 0.2    |
| Trace Impurities – Vanadium (V)                        | <= 1.0 ppb    | < 0.2  |
| Trace Impurities – Zinc (Zn)                           | <= 5.0 ppb    | 0.3    |
| Trace Impurities – Zirconium (Zr)                      | <= 1.0 ppb    | < 0.1  |

For Laboratory, Research or Manufacturing Use

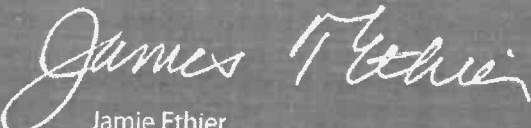
Product Information (not specifications):

Appearance (clear, fuming liquid)

Meets ACS Specifications

Country of Origin: US

Packaging Site: Phillipsburg 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 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone: 610.386.1700



Nitric Acid 69%  
CMOS



R → 11/12/24

M6126

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 (HNO <sub>3</sub> )         | 69.0 – 70.0 % | 69.7 %      |
| Appearance                        | Passes Test   | Passes Test |
| Color (APHA)                      | ≤ 10          | 5           |
| Residue after Ignition            | ≤ 2 ppm       | 1 ppm       |
| Chloride (Cl)                     | ≤ 0.08 ppm    | < 0.03 ppm  |
| Phosphate (PO <sub>4</sub> )      | ≤ 0.10 ppm    | < 0.03 ppm  |
| Sulfate (SO <sub>4</sub> )        | ≤ 0.2 ppm     | < 0.2 ppm   |
| Trace Impurities – Aluminum (Al)  | ≤ 40.0 ppb    | < 1.0 ppb   |
| Arsenic and Antimony (as As)      | ≤ 5.0 ppb     | < 2.0 ppb   |
| Trace Impurities – Barium (Ba)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Beryllium (Be) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Bismuth (Bi)   | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities – Boron (B)      | ≤ 10.0 ppb    | < 5.0 ppb   |
| Trace Impurities – Cadmium (Cd)   | ≤ 50 ppb      | < 1 ppb     |
| Trace Impurities – Calcium (Ca)   | ≤ 50.0 ppb    | 2.3 ppb     |
| Trace Impurities – Chromium (Cr)  | ≤ 30.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Cobalt (Co)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Copper (Cu)    | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Gallium (Ga)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Germanium (Ge) | ≤ 20 ppb      | < 10 ppb    |
| Trace Impurities – Gold (Au)      | ≤ 20 ppb      | < 5 ppb     |
| Heavy Metals (as Pb)              | ≤ 100 ppb     | 100 ppb     |
| Trace Impurities – Iron (Fe)      | ≤ 40.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Lead (Pb)      | ≤ 20.0 ppb    | < 10.0 ppb  |
| Trace Impurities – Lithium (Li)   | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb      | < 1 ppb     |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb    | < 1.0 ppb   |
| Trace Impurities – Nickel (Ni)    | ≤ 20.0 ppb    | < 5.0 ppb   |

>>> Continued on page 2 >>>

Nitric Acid 69%  
CMOS

 **avantor**<sup>TM</sup>



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

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

For Microelectronic Use

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



Jamie Croak  
Director Quality Operations, Bioscience Production