

8900, Fax: 908 789 8922

Prep Standard - Chemical Standard Summary

Order ID: Q2444

Test: Metals Group4

Prepbatch ID: PB168664,

Sequence ID/Qc Batch ID: LB136345,LB136377,

Standard ID:

MP85156,MP86192,MP86193,MP86194,MP86195,MP86196,MP86211,MP86212,MP86213,MP86214,MP86215,MP86216,MP86217,MP86218,

Chemical ID:

M5467, M5470, M5471, M5499, M5658, M5747, M5748, M5751, M5798, M5799, M5800, M5801, M5811, M5814, M5816, M5820, M5942, M5962, M5970, M5984, M5985, M5996, M5997, M6007, M6015, M6021, M6023, M6028, M6030, M6032, M6076, M6127, M6128, M6137, M6142, M6144, M6145, M6146, M6151, M6152, M6155, M6158, M6159, M6162, M6163, M6164, M6165, W 3112, M6164, M6165, W6164, W6165, W6164, W6164,



Alliance

Metals STANDARD PREPARATION LOG

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

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

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | ScaleID | PipetteID | Supervised By |
|--------------|------|-----|------------|--------------------|----------------|---------|-------------|-----------------|
| 902 | | | 06/25/2025 | <u> </u> | Janvi Patel | | METALS PIP | Sarabjit Jaswal |
| | , , | | | | | | ETTE_1 (ICP | 07/03/2025 |

FROM 125.00000ml of M6151 + 2350.00000ml of W3112 + 25.00000ml of M6162 = Final Quantity: 2500.000 ml



Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe | | | | Expiration | Prepared | | | Supervised By | | |
|-----------|----------------------|---------|------------|-------------|-------------|----------------|------------------|-----------------|--|--|
| <u>ID</u> | NAME | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabjit Jaswal | | |
| 907 | ICP AES STD S (S5) | MP86193 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP | | | |
| | | | | | | | ETTE_1 (ICP | 07/03/2025 | | |
| | A) | | | | | | | | | |

FROM

5.00000ml of M5467 + 5.00000ml of M5470 + 5.00000ml of M5816 + 5.00000ml of M5820 + 5.00000ml of M5996 + 5.00000ml of M5997 + 5.00000ml of M6076 + 5.00000ml of M6146 + 455.00000ml of MP86192 = Final Quantity: 500.000 ml

| Recipe | | | | Expiration | Prepared | | | Supervised By | |
|-----------|----------------|------------|------------|-------------|-------------|----------------|------------------|-----------------|--|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabjit Jaswal | |
| 910 | ICP AES STD S4 | MP86194 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP | | |
| | | | | | | | ETTE_1 (ICP | 07/03/2025 | |
| | A) | | | | | | | | |

FROM 50.00000ml of MP86192 + 50.00000ml of MP86193 = Final Quantity: 100.000 ml



Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME. | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------------------|---------|------------|--------------------|----------------|----------------|---------------------------|-------------------------------|
| 909 | ICP AES STD S3 | MP86195 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP ETTE 1 (ICP | |
| | 25 00000-1 of MD00402 + 75 00000 | | 100 5: 10 | | • | | A) | 07/03/2025 |

FROM 25.00000ml of MP86193 + 75.00000ml of MP86192 = Final Quantity: 100.000 ml

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|-----------|----------------|------------|------------|-------------|-------------|----------------|------------------|-----------------|
| <u>ID</u> | <u>NAME</u> | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabjit Jaswal |
| 3913 | ICP AES STD S2 | MP86196 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP | |
| | | | | | | | ETTE_1 (ICP | 07/03/2025 |

FROM 16.00000ml of MP86193 + 184.00000ml of MP86192 = Final Quantity: 200.000 ml



Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe | | | , | Expiration | <u>Prepared</u> | 0 1 15 | D: // ID | Supervised By |
|-------------------|-------------------------------|----------------|-------------------------|---------------------------|--------------------------|------------------------|-----------------------|-----------------|
| <u>ID</u> 2950 | NAME ICP AES S1/CRI STOCK STD | NO. MP86211 | Prep Date 06/25/2025 | <u>Date</u> 07/18/2025 | <u>By</u> Janvi Patel | <u>ScaleID</u> None | PipetteID METALS PIP | Sarabjit Jaswal |
| | | | | | | ,,,, | ETTE_1 (ICP | |

FROM

 $0.03000 \text{ml of M5798} + 0.03000 \text{ml of M6028} + 0.04000 \text{ml of M6137} + 0.05000 \text{ml of M5658} + 0.05000 \text{ml of M5811} + 0.05000 \text{ml} \\ 0.05000 \text{ml of M6030} + 0.05000 \text{ml of M6159} + 0.06000 \text{ml of M5747} + 0.10000 \text{ml of M5471} + 0.10000 \text{ml of M5751} + 0.10000 \text{ml of M5801} + 0.10000 \text{ml of M5820} + 0.10000 \text{ml of M5962} + 0.10000 \text{ml of M5970} + 0.10000 \text{ml of M6128} + 0.15000 \text{ml of M5800} + 0.20000 \text{ml of M5748} + 0.20000 \text{ml of M5799} + 0.20000 \text{ml of M6021} + 0.20000 \text{ml of M6023} + 0.20000 \text{ml of M6145} + 0.25000 \text{ml of M6146} + 0.50000 \text{ml of M6142} + 1.00000 \text{ml of M6142} + 1.00000 \text{ml of M6144} + 2.00000 \text{ml of M5816} + 89.29000 \text{ml of MP86192} = Final Quantity: 100.000 \text{ml}$

| Recipe ID | NAME. | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------------------|------------|------------|--------------------|----------------|----------------|---------------------------|-------------------------------|
| 2951 | ICP AES S1/CRI WORK STD | MP86212 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP ETTE_1 (ICP | |
| | | | | | | | A) | |

FROM 2.00000ml of MP86211 + 98.00000ml of MP86192 = Final Quantity: 100.000 ml



Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipettelD</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------|------------|------------|--------------------|----------------|----------------|---------------------------|-------------------------------|
| 4163 | NEW ICV-060925 | MP86213 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP ETTE_1 (ICP | • |
| | | | | | | | A) | |

FROM 0.20000ml of M6163 + 0.20000ml of M6164 + 0.20000ml of M6165 + 49.40000ml of MP86192 = Final Quantity: 50.000 ml

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|-------------------|---------|------------|--------------------|----------------|----------------|---------------------------|-------------------------------|
| 904 | ICP AES ICSA SOLN | MP86214 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP ETTE_1 (ICP | • |

FROM 10.00000ml of M6152 + 80.00000ml of MP86192 = Final Quantity: 100.000 ml



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone \; : \; 908 \; 789 \; 8900, \\$

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe | | | | Expiration | Prepared | | | Supervised By | |
|-----------|--|---------|------------|-------------|-------------|----------------|------------------|-----------------|--|
| <u>ID</u> | <u>NAME</u> | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabjit Jaswal | |
| 3494 | ICP AES ICSAB SOLN-1 | MP86215 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP | | |
| | | | | | | | ETTE_1 (ICP | 07/03/2025 | |
| FROM | 10.00000ml of M6152 + 10.00000ml of M6155 + 80.00000ml of MP86192 = Final Quantity: 100.000 ml | | | | | | | | |

| Recipe | | | | <u>Expiration</u> | <u>Prepared</u> | | | Supervised By |
|-----------|------------------|---------|------------|-------------------|-----------------|----------------|------------------|-----------------|
| <u>ID</u> | NAME | NO. | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | Sarabjit Jaswal |
| 911 | ICP AES CCV SOLN | MP86216 | 06/25/2025 | 07/18/2025 | Janvi Patel | None | METALS_PIP | |

ETTE_1 (ICP

07/03/2025

FROM 50.00000ml of MP86192 + 50.00000ml of MP86193 = Final Quantity: 100.000 ml



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone \; : \; 908 \; 789 \; 8900, \\$

Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|----------------------|---------|------------|--------------------|----------------|----------------|---------------------------|-------------------------------|
| 919 | ICP AES INTERNAL STD | MP86217 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP ETTE_1 (ICP | |
| | | | | | | | A) | |

FROM 1.00000ml of M5984 + 10.00000ml of M5985 + 1969.00000ml of W3112 + 20.00000ml of M6162 = Final Quantity: 2000.000 ml

| Recipe ID | <u>NAME</u> | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | <u>PipetteID</u> | Supervised By Sarabjit Jaswal |
|--------------|--------------------|---------|------------|--------------------|----------------|----------------|---------------------------|-------------------------------|
| 903 | ICP AES RINSE SOLN | MP86218 | 06/25/2025 | 07/18/2025 | Janvi Patel | | METALS_PIP ETTE_1 (ICP | • |

FROM 200.0000ml of M6162 + 9800.0000ml of W3112 = Final Quantity: 10000.000 ml



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57058 / Cerium, 1000PPM, 100ML | 020623 | 02/06/2026 | 03/06/2023 / bin | 03/01/2023 / bin | M5467 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57038 / Sr, 1000 PPM, 125 ml | 082922 | 08/29/2025 | 04/14/2025 / jaswal | 03/16/2023 / jaswal | M5470 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Absolute Standards, Inc. | 57038 / Sr, 1000 PPM, 125 ml | 082922 | 08/29/2025 | 04/14/2025 / jaswal | 03/16/2023 / jaswal | M5471 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Absolute Standards, Inc. | 58120 / Ca, 10000 PPM, 500 ml | 031523 | 03/15/2026 | 04/17/2025 / Janvi | 03/17/2023 / bin | M5499 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58024 / Chromium, Cr, 500 ml, 1000 PPM | 060523 | 06/05/2026 | 08/28/2023 / jaswal | 08/25/2023 / jaswal | M5658 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | / Lead (Pb) 1000PPM | 100923 | 10/09/2026 | 05/20/2024 / Jaswal | 12/20/2023 / jaswal | M5747 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | / Nickel (Ni) 1000PPM | 091223 | 09/12/2026 | 01/02/2024 / bin | 12/20/2023 / jaswal | M5748 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58029 / Cu, 1000 PPM, 500 ml | 071723 | 07/17/2026 | 10/01/2024 / Jaswal | 08/25/2023 / jaswal | M5751 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57004 / Be, 1000 PPM, 125 ml | 102523 | 10/25/2026 | 02/09/2024 / bin | 02/09/2024 / bin | M5798 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57050 / Sn, 1000 PPM, 125 ml | 071123 | 07/11/2026 | 02/09/2024 / bin | 02/09/2024 / bin | M5799 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Absolute Standards, Inc. | 57027 / CO, 1000 PPM, 125 ml | 091923 | 09/19/2026 | 05/31/2024 / bin | 02/09/2024 / bin | M5800 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57033 / As, 1000 PPM, 125 ml | 111323 | 11/13/2026 | 02/09/2024 / bin | 02/09/2024 / bin | M5801 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|----------------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 58126 / Fe, 10000 PPM, 500 ml | 051523 | 05/15/2026 | 02/06/2025 / kareem | 01/03/2024 / jaswal | M5811 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | , | | 07/11/2026 | 03/26/2024 / Sohil | 01/03/2024 / jaswal | M5814 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57016 / S, 1000 PPM, 125 ml | 122923 | 12/29/2026 | 05/20/2024 / Jaswal | 02/09/2024 / jaswal | M5816 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57015 / P, 1000 PPM, 125 | 091123 | 09/11/2026 | 05/01/2024 / jaswal | 02/09/2024 / jaswal | M5820 |
| | | | | | | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| Supplier Inorganic Ventures | ItemCode / ItemName CGTI1-1 / TITANIUM 125mL 1000ug/mL | Lot # T2-TI719972 | 1 - | - | | |
| Inorganic | CGTI1-1 / TITANIUM | | Date | Opened By 06/18/2024 / | Received By 02/22/2024 / | Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|--|--------------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57003 / Li, 1000 PPM, 125 ml | 061224 | 06/21/2027 | 07/01/2024 / Jaswal | 07/01/2024 / Jaswal | M5970 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | = | | 02/20/2029 | 08/05/2024 / kareem | 06/14/2024 / Jaswal | M5984 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CGIN10-5 / INDIUM 1 x 500 ml | U2-IN729349 | 02/21/2028 | 10/08/2024 / Jaswal | 06/14/2024 / Jaswal | M5985 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL | T2-MEB714417 | 01/27/2027 | 05/07/2024 / JANVI | 02/22/2024 / kareem | M5996 |
| | GOLO HOIVINI, IZOME | | | | | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Supplier Inorganic Ventures | | Lot # T2-MEB727800 | - | - | | |
| Inorganic | ItemCode / ItemName CLPP-CAL-3 / CLP CAL | | Date | Opened By 02/03/2025 / | Received By 02/22/2024 / | Lot # |



| 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 | 06/19/2025 / MOHAN | 05/14/2024 / Jaswal | M6015 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57023 / V, 1000 PPM, 125 ml | 062424 | 06/24/2027 | 09/28/2024 / jaswal | 08/05/2024 / Jaswal | M6021 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | te 57081 / TI, 1000 PPM, 125 | | 06/27/2027 | 08/05/2024 / kareem | 08/05/2024 / Jaswal | M6023 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57048 / Cd, 1000 PPM, 125 ml | 070124 | 07/01/2027 | 08/05/2024 / kareem | 08/05/2024 / Jaswal | M6028 |
| | | | | | | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / | Received Date / | Chemtech Lot # |
| Supplier Absolute Standards, Inc. | ItemCode / ItemName 57047 / Ag, 1000 PPM, 125 ml | Lot # 122823 | - | - | | |
| Absolute | 57047 / Ag, 1000 PPM, | | Date | Opened By 08/05/2024 / | Received By 08/05/2024 / | Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|-----------------|--------------------|----------------------------|--|-----------------------|
| Inorganic Ventures | Z9651Q / CHEM-CLP-4/.25L | V2-MEB746762 | 01/01/2026 | 01/01/2025 / kareem | 09/19/2024 / kareem | M6076 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 9, | | 11/21/2027 | 01/13/2025 / kareem | 01/13/2025 / kareem | M6127 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | solute 58025 / Mn, 1000 PPM, | | 10/11/2027 | 01/13/2025 / kareem | 01/13/2025 / kareem | M6128 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic | CGSI1-1 / SILICON 125mL | V2-SI744713 | 07/10/2029 | 01/14/2025 / | 10/03/2024 / | |
| Ventures | 1000ug/mL | | 07/10/2029 | Jaswal | Jaswal | M6137 |
| Ventures Supplier | 1000ug/mL ItemCode / ItemName | Lot # | Expiration Date | | | M6137 Chemtech Lot # |
| | <u> </u> | Lot # 103024 | Expiration | Jaswal Date Opened / | Jaswal Received Date / | Chemtech |
| Supplier Absolute | ItemCode / ItemName 58119 / K, 10000 PPM, | | Expiration Date | Date Opened / Opened By | Received Date / Received By 01/13/2025 / | Chemtech Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 58030 / Zinc, Zn, 500 ml, 1000 PPM | 121724 | 12/17/2027 | 02/04/2025 / | 01/13/2025 / Jaswal | M6145 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57051 / Sb, 1000 PPM, 125 ml | 071724 | 07/17/2027 | 01/31/2025 / kareem | 10/18/2024 / kareem | M6146 |
| 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) | 22G2862015 | 08/18/2025 | 02/18/2025 / Sagar | 01/15/2025 / Sagar | M6151 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| EPA | PART A / ICSA (ICP) STOCK SOLN | ICSA-1211 | 08/24/2025 | 02/24/2025 / kareem | 04/20/2021 / kareem | M6152 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / | Chemtech Lot # |
| EPA | PART B / ICSAB (ICP) STOCK SOLN | ICSB-0710 | 06/30/2025 | 02/10/2025 / kareem | 02/09/2024 / kareem | M6155 |
| 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 | 03/25/2029 | 03/10/2025 / Eman | 02/02/2025 / Sagar | M6158 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|--|--------------|--------------------|----------------------------|---|-----------------------|
| Absolute Standards, Inc. | 58113 / AI, 10000 PPM, 500 ml | 011325 | 03/18/2026 | 03/18/2025 / kareem | 02/09/2025 / kareem | M6159 |
| 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) | 24H0162012 | 11/27/2025 | 05/27/2025 / Sagar | 04/27/2025 / Sagar | M6162 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | rganic QCP-CICV-1-125ML / EPA | | 05/22/2029 | 06/09/2025 / jaswal | 06/06/2025 / jaswal | M6163 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic | QCP-CICV-2-125ML / EPA | U2-MEB733713 | 06/01/2028 | 06/09/2025 / | 06/09/2025 / | |
| Ventures | CLP ICP Verification Standard2 | | 06/01/2026 | jaswal | jaswal | M6164 |
| Ventures Supplier | CLP ICP Verification | Lot # | Expiration Date | | | M6164 Chemtech Lot # |
| | CLP ICP Verification Standard2 | | Expiration | jaswal Date Opened / | jaswal Received Date / | Chemtech |
| Supplier Inorganic | ItemCode / ItemName QCP-CICV-3-125ML / EPA CLP ICP Verification | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By 06/09/2025 / | Chemtech Lot # |

Certified Reference Material CRM

M6032

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

CERTIFIED WEIGHT REPORT: Part Number: Lot Number: 010924 57056 Solvent: 24002546 Lot # Nitric Acid Giovannie Lasas EL

Recommended Storage: **Expiration Date:** Description: Ambient (20 °C) 010927 Barium (Ba) 2% 40.0

Nitric Acid

Formulated By:

Giovanni Esposito

010924

Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): **NIST Test Number: 6UTB** 1000 2000.02 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Expanded Pedro L. Rentas

Lot Nominal SDS Information

Barium nitrate (Ba) IN023 BAD022019A1 RV# Number Conc. (µg/mL) 1000 99.999 38 Purity (%) 0,10 52.3 8 Weight (g) 3.82417 Weight (g) Conc. (µg/mL) 3.82441 1000.1 +/- (µg/mL) 2.0 10022-31-B CAS# 0.5 mg/m3 SRM

Purity Uncertainty Assay Target Actual Actual Uncertainty

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

010924

orl-rat 355 mg/kg 3104a

[1] Spectrum No.1

m/z-> m/z-> m/z-> 2.5E6 5.0E6 2.0E5 1.0ES 2.0≡6 1.0E6 200 110 0 NNO 120 20 [12.514 sec]:58156.D# [Count] [Linear] 230 130 30 140 1040 4 150 NSO 50 160 1200 00 170 70 180 80 190 90 200 100

Part # 57056



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

| | ſ | B | В | | ᆏ | Ва | 2 | D _C | 0 | 2 | ≥ | | ĺ | | |
|----------------|-------|---------|---------------|---------------|---------------|-------------|--------------|----------------|--------------|------------|--------------------------|--|--|----------|--|
| e. | | ۵ 69 | 0.02 | 10.01 | 3 | - | 10.1 | 3 | 40.02 | | A).02 | STREET, STREET | | | |
| | | ဥ | င | 2 | 5 | င္ပ | ξ | 3 | Ç |) | 8 | Column A Lance | | | |
| | | A 02 | 6 .02 | 20.02 | 3 | & 0.02 | 20.02 | 3 | 40,2 | | 200 | | | | |
| | | AII | ටු | Va. | ? | 2 | E | 7 | 댗 | 7 | T _W | | ı | | |
| | 20.00 | 3 | 40.02 | 20.02 | 3 | <u>0.02</u> | <0.02 | 3 | ∆ .02 | 10.04 | 2003 | THE STREET | The Real Property lies, the Persons in column 2 is not the Per | | |
| | | Ş | 2 | FG. | 1 ; | = | Þ | 1 | 픙 | 111 | 311 | STATE OF | I. | | |
| | 70.02 | 3 | ∆ 0.02 | 8 | , ; | A 02 | <0.02 | | <u>&</u> | 20.02 | 2000 | | | race M | |
| | Z | 2 | Mo | 냺 | | <u> </u> | Me | | Ē, | 1 | | | | STA | |
| | 20.02 | 3 6 | A)(2) | 802 | 20.00 | 3 | 40.01 | | A0.02 | 20.03 | 200 | THE PROPERTY AND PERSONS ASSESSMENT OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN CO | 40111100 | Serifica | |
| Target analyte | 2 | 4 ; | ¥ | Þ | ć | 2 | ဝွ | | ş | 2 | 1 | OF SHAPPS | | 5. | |
| STO | .ĕ. | 20.02 | 3 | 40.02 | 10.02 | 3 | ∆ .02 | 10.04 | 3 | 40.02 | | | by ICI | 797 | |
| | S | 1 2 1 | 3 | 잗 | 20 | 9 | 2 | 18 | ರ | 7 | 1 | | NO C | ころ | |
| | 40.02 | 20:02 | 3 | ∆ 0.02 | 20.02 | 3 | 80.02 | 10.02 | 3 | 40.02 | | | /9/ IIIL/ | | |
| | Ta | C | a ; | Y. | EN | 1 | À | 2 | 2 | Se | | | | | |
| | A0.02 | 20.02 | 3 | A0.02 | 707 | • | A 02 | 20.02 | 3 | <u>6</u> 2 | The second second second | | | | |
| | ij | OII | 2 | 3 | 15 | 1 | ⊒ | ī | 3 | 7 | | | | | |
| | 40.02 | 20.02 | 3 8 | 3 | A0.02 | 6 6 6 | 400 | 20.02 | 3 | 40.02 | | | | | |
| | 27 | 2 | 1, | < | ð | | < | c | 1 : | 8 | | | | | |
| | <0.02 | <0.02 | 0.00 | 3 | ∆ 0.02 | 10.02 | 3 | 20.02 | | 2000 | Section of the second | | | | |

Physical Characterization:

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

Certified by:

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

Expiration Date:

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

SDS Information

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

NIST SRM

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

1 of 2

Certified Reference Material CRM



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

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

| | F | בַ ע | ğ (| # \$ | Z : | Δ. | Ş. | 2 | | Ī | |
|-------------------------------|--------------|-------|------------|--------|--------------|------------|-------|------------------------------|---|----------|--|
| | 10:04 | 3 6 | 9 6 | 2 6 | 3 6 | A 8 | 800 | 40.02 | | | |
| | 2 | 3 5 | 3 5 | ۶ (| 3 5 | 3 5 | 3 | 2 | | | |
| | 20.02 | 6.5 | 20.02 | 3 8 | 3 5 | 3 ; | 3 | Т | | | |
| | Nu. | Š |) <u>ç</u> | 3 5 | 5 5 | 7 0 | p , | Dγ | | | |
| | 20.02 | 3 5 5 | 20.02 | 0.02 | 20.02 | 3 8 | 3 | 40.02 | STATISTICS SEEDING | | |
| | 29 | 1 5 | , <u>4</u> | 1 14 | 1 15 | 1 10 | 5 | H | SOUTH | _ | |
| | 40,02 | 60.02 | 20.2 | 20.02 | 20.02 | 8.62 | 3 | A0.02 | AND MANAGEMENT OF THE PARTY OF | race Me | |
| | Za | Mo | 9H | щM | 3kM | ַ בַ | • | E | | fetals | |
| (T) = Target analyte | 40.02 | 40.02 | 40.2 | <0.02 | 40.01 | 20.02 | | 40.02 | | Verifica | |
| get anal | × | 7 | ď | Pd | ွှ | 2 | : | Z. | | ition | |
| yte | 802 | 40.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.00 | <0000 | | by ICP- | |
| | Sc | Sm | Ru | RЬ | R | Re | 1 | P. | | NS (| |
| | 40.02 | 40.02 | 40.02 | 40.02 | <0.02 | <0.02 | 40.02 | 000 | | ug/mL) | |
| | Ta | S | Sr | Z | Age | 8 | č | S | 200000000 | | |
| | 0.02 | 40.02 | 40.02 | 40.2 | 40.02 | 40.02 | 7.07 | 3 | The second second | | |
| | 11 | Sn | Tm | Ħ | Ħ | Te | 10 | | | | |
| | <0.02 | <0.02 | <0.02 | \$0,02 | 40.02 | <0.02 | 20.02 | 5 | | | |
| | Zz | Zn | ĸ | 뀾 | < | U | * | THE PERSON NAMED IN COLUMN 1 | | | |
| | <0.02 | <0.02 | 40.02 | <0.02 | 40.02 | 40,02 | 20.02 | | | | |

Physical Characterization:

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

Certified by:

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

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

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

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

M5810 M5811

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: Description:

58126 051523 Iron (Fe)

R: 01/03/24

Solvent: 21110221 Lot # Nitric Acid

Formulated By:

J. Brans

であるから

5.0%

250.0

Nitric Acid

Giovanni Esposito

051523

Reviewed By:

Pedro L. Rentas

051523

Purity Uncertainty Assay 0.12 Flask Uncertainty Expanded SDS Information

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

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

1. Iron (Fe)

Compound

RM#

Number E E

Conc. (µg/mL)

36

Purity (%)

8

Nominal

Nominal Concentration (µg/mL):

NIST Test Number:

BTUB 10000

5E-05 Balance Uncertainty

Recommended Storage:

Ambient (20 °C) 051526

Expiration Date:

Weight shown below was diluted to (mL):

5000.1

Uncertainty

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

LD50

SRM

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

70 BO 90

100

m/2->

10

20

30

40

S O

60

1.054

2.0E4

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

1.0E8

200

m/z->

110

120

130

5.0E7

1.0E8-

5.0E7

230 240

250

260

1 of 2

Lot # 051523

T/2->

210

220

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

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

| | Al Sb As Ba Be | i i |
|----------------------|--|---------|
| | | |
| | 40.02 40.02 40.02 40.02 40.02 | |
| | ទី ទី ១ ១ ១ ១ ១ | |
| | 0.10 0.10 0.10 | |
| | | |
| | Au Ge | |
| | 40.02 40.02 40.02 40.02 40.02 | |
| | # # # # # # # # # # # # # # # # # # # | |
| | 40 f2 40 f2 40 f2 40 f2 40 f2 40 f2 | Trace |
| | Man | Meta |
| _ | | ls Ve |
| (T) = Tarnet analyta | 0.10 0.20 0.20 | rificat |
| | × P P B S N | tion t |
| 1 | 40.02 40.02 40.02 40.02 40.02 | y ICP- |
| | Rb Sm Sc | MS (L |
| | овствен | /g/m |
| | 66688888 | |
| | Se Se Se Sr Sr Sr | |
| | 402 402 402 402 402 402 | |
| | 1 | |
| | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | - |
| | | |
| | \$ 5 7 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | |
| | 40.02 40.02 40.02 40.02 | |

(I) = larger analyte

Physical Characterization:

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

Certified by:

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

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

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

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



Certificate of Analysis

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

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-1

Lot Number:

T2-MEB723367

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

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

Iron,

200 μg/mL ea:

Sodium,

Magnesium, Aluminum, Cerium, Selenium,

Thallium,

100 μg/mL ea:

Lead, Calcium,

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

40 μg/mL ea: Chromium,

30 μg/mL ea:

Copper, Boron,

Vanadium,

20 μg/mL ea:

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

7.5 µg/mL ea: Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

Assay Information:

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

Page 4 of 6

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_g = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 30, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

| Sealed TCT Bag Open 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

DD978hi.



Certificate of Analysis

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 **ACCREDITATION / REGISTRATION**

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-2

Lot Number:

U2-MEB731108

Matrix:

5% (v/v) HNO3

tr. HF

Value / Analyte(s):

200 µg/mL ea:

Silica,

80 µg/mL ea: Antimony, 70 µg/mL ea:

Tin,

40 µg/mL ea: Molybdenum,

20 µg/mL ea: Titanium

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

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

Silica, SIQ2

200.2 ± 1.3 μg/mL

Tin, Sn

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

Titanium, Ti

20.01 ± 0.13 µg/mL

Density:

1.025 g/mL (measured at 20 ± 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_a = mean of Assay Method A with

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

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/Δ

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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 3D978hi.

Certifying Officer:

Paul Gaines
Chairman / Senior Technical I

Chairman / Senior Technical Director

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



Certified Reference Material CRM

R: 03/01/23(12)



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

| | | | | | | | The state of the s | Lot # Solvent: 21110221 Nitric Acid Pormulated By: Law (mL) SE-05 Balance Uncertainty SE-05 Balance Unce |
|--|--|--|--|--|--|--|--|--|
| Solvent: 2110221 Nitric Acid Peritum (Ce) Solvent: 21110221 Nitric Acid Certum (Ce) | Solvent: 2110221 Nitric Acid Perturn (20°C) 1000 1 | Solvent: 2110221 Nitric Acid Portunition Solvent: 21110221 Nitric Acid Certum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Nominal Burty Hacardight Agency Towns Assess |
| Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Pormulated By: Lawrence Barry 020623 1000 6UTB 5E-05 Baiance Uncertainty SE-05 Baiance Uncertainty Actual Location Actual | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) (mL) (mL) | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Certum (Ce) Certum (Ce) | Solvent: 21110221 Nitric Acid Portunisted By: Lawrence Barry 020623 Certum (Ce) Certum (Ce | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum Cell D20623 Cell | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 20.0 Nitric Acid Formulated By: Lawrence Barry 020623 Cerlum (Ce) Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry 020623 1000 6UTB 5E-05 Balance Uncertainty 5E-05 Balance Uncertainty Actual Actual Actual Actual Actual Actual Actual Cohemic Safety Info On Attached Actual Uncertainty Cohemic Safety Info On Attached Actual Centural | Solvent: 2110221 Nitric Acid Cerlum (Ce) | Lot # Solvent: 2110221 Nitric Acid Cerlum (Ce) | Nominal Purity Uncertainty Assay. Target Actual Actual Uncertainty (Solvent Safety Info On Attached on 1 |
| Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry (mL) SE-05 Balance Uncertainty SE-05 Fleak Uncertainty Secure Actual Actual Actual Uncertainty Secure Solvent Safety Info. On Attached por Solvent Safety Info. On Solvent Safety Info. | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) (mL) (mL) | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) (mL) (mL) | Solvent: 21110221 Nitric Acid Portunistical By: Lawrence Barry D20623 Certum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry 020623 Cerlum (Ce) 1000 6UTB 5E-05 Belance Uncertainty Actual Uncertainty Cohemical Con Attached (Con Attached Con | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) Solvent: 21110221 Nitric Acid Cerlum (Ce) | Lot # Solvent: 2110221 Nitric Acid Cerlum (Ce) | Nominal Purity Uncertainty Assay. Target Actual Actual Uncertainty (Solvent Safety Info. On Attached on) |
| Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Pormulated By: Lawrence Barry 020623 1000 6UTB 5E-05 Baiance Uncertainty SE-05 Baiance Uncertainty Actual Act | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) (mL) (mL) | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Certum (Ce) (mL) (mL) | Solvent: 21110221 Nitric Acid Portunistical By: Lawrence Barry D20623 Certum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum Cell C | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry 020623 Cerlum (Ce) 1000 6UTB 5E-05 Balance Uncertainty Actual Lot Nominal Purity Uncertainty Assay Target Actual Actual Actual Actual Cohemic Safety Info On Attached (co.) Cohemic Safety Info On | Solvent: 2110221 Nitric Acid Cerlum (Ce) Solvent: 21110221 Nitric Acid Cerlum (Ce) | Lot # Solvent: 2110221 Nitric Acid Cerium (Ce) Solvent: 21110221 Nitric Acid Cerium (Ce) Cerium (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry 020623 1000 6UTB 5E-05 Balance Uncertainty Actual Cohent Safety Info On Attached (Con Attached (C | Nominal Purity Uncertainty Assay. Target Actual Actual Uncertainty (Solvent Safety Info On Attached on) |
| Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Certum (Ce) Certum (Ce) | Solvent: 2110221 Nitric Acid Porturn (20 °C) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) (mL) (mL) | Solvent: 21110221 Nitric Acid Portion Po | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) Cerlum (Ce) | Solvent: 2110221 Nitric Acid Cerlum (Ce) | Solvent: 2110221 Nitric Acid Formulated By: Lawrence Barry Dedro L. Rentas D20623 D | Nominal Purity Uncertainty Assay. Target Actual Incertainty (Salvant Safety Info On Assay |
| Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) Cerlum (Ce) | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Certum Celtum C | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Certum Centum C | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Formulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 2110221 Nitric Acid Formulated By: Lawrence Barry 020623 | Nominal Purity Uncertainty Assay Tamet Artical Artical Contract Calculate Contract C |
| Solvent: 2110221 Nitric Acid Peritum (Ce) Solvent: 21110221 Nitric Acid Certum (Ce) | Solvent: 2110221 Nitric Acid Perity Uncertainty Deciro L Rentas Deciro L Ren | Solvent: 2110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerium (Ce) (mL) (mL) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry 020623 Cerlum (Ce) Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry D20623 Cerlum (Ce) | Nominal Purity Invariants Assess Towner Assess |
| Lot # | Lot # | Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Combient (20 °C) 1000 GUTB SE-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty SE-05 Balance Uncertainty Combient (Combined to (mL): 1000.12 0.058 Flask Uncertainty Expanded SDS Information | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certium (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Combient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Expanded SDS Information SDS Inform | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Expanded SDS Information SDS Inf | Lot # | Lot # | Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Color C | Moneton During Hannahalton American |
| Lot # | Lot # | Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certium (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Education Expanded SDS Information SDS Infor | Lot # | Lot # | Lot # | E.Ot # E.Ot # E.Ot # E.Ot # Expanded Solvent: 21110221 Nitric Acid Nitric Acid Expanded Solvent: 21110221 Nitric Acid Nitric Acid Expanded Solvent: 21110221 Nitric Acid | Solvent: 21110221 Nitric Acid Permulated By: Lawrence Barry (mL) 1000.12 0.058 Plask Uncertainty Expanded SDS Information | |
| Lot # | Example Exam | Lot # | Lot # | |
| Lot # | Lot # | Lot # | Lot # Solvent: 21110221 Nitric Acid | Lot # | Lot # | Lot # | Lot # | |
| Lot # Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerium (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty Gutb Co.12 0.058 Plask Uncertainty Co.058 Plask Unc | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Gluted to (mL): 1000.12 0.058 Plask Uncertainty Gluted to (mL): 1000.12 0.058 Plask Uncertainty Pedro L. Rentas Pedro L. Rentas | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Gluted to (mL): 1000.12 0.058 Plask Uncertainty Gluted to (mL): 1000.12 0.058 Plask Uncertainty Pedro L. Rentas Pedro L. Rentas | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Gliuted to (mL): 1000.12 0.058 Plask Uncertainty Gliuted to (mL): 1000.12 0.058 Plask Uncertainty Cerlum (Ambient (20 °C) 1000.12 0.058 Plask Uncertainty Cerlum (20 °C) Cerlum (20 | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Col. 12 0.058 Pleast Uncertainty Pedro L. Rentas Col. 1000 Col. 12 0.058 Pleast Uncertainty Col. 12 0.058 Pleast Uncertainty Col. 13 Col. 13 Col. 14 Col. 15 | Lot # | Lot # | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Company | |
| Lot # | Lot # Lawrence Barry | Lot # Lawrence Barry | Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Editor L Rentas Cerlum (L): 1000.12 0.058 Resk Uncertainty Pedro L Rentas Cerlum (Ce) Cerl | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Editor Lawrence Barry 1000 12 0.058 | Lot # | Lot # | Lot # | |
| Lot # | Lot # Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Editor Pedro L. Rentas Cerlum (Ce) Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Cerlum (Ce) Cerlum (| Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Editor Pedro L. Rentas Cerlum (Ce) Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Cerlum (Ce) Cerlum (Ce) Cerlum (Ce) Lawrence Barry (mL) 1000 Cellum (Cellum (Cel | Lot # | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Batance Uncertainty Editor Pedro L. Rentas Editor Co.058 Plask Uncertainty Pedro L. Rentas Cerlum Editor Cerlum Editor Cerlum Editor Cerlum Editor Cerlum Editor Cerlum C | Lot # Lot # | E.Ot # E | Lot # | |
| Lot # | Lot # | Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Edulemed By: Pedro L. Rentas P | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty SE-05 Balance Uncertai | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty GUTB 5E-05 Balance Uncertainty GUTB 5E-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty SE-05 Balance U | Example Exam | Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerium (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty GUTB 5E-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty SE-05 Balance Un | Lot # | |
| Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 SE-05 Balance Uncertainty SE-05 Balance Uncertainty Sel-05 Balance Un | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 SE-05 Balance Uncertainty SE-05 Balance Uncertainty Sel-05 Balance Uncertaint | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty GUTB 5E-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty Serviewed By: Pedro L. Rentas Pedro L. R | Lot # Solvent: 21110221 Nitric Acid Centum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty GUTB 5E-05 Balance Uncertainty GUTB 5E-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty SE-05 Balance Uncert | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Sel-05 Balance Uncer | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 20.0 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty GUTB SE-05 Balance Uncertainty SE-05 | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Edviewed By: Pedro L. Rentas Pedro L. Rentas Edviewed By: Pedro L. Rentas | Lot # | |
| Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2000 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Cot | Lot # Lot # | Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2000 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Cot Cot Cerlum (L) 1000 12 0.058 Peart Incorpainty Cot Cot Cerlum (Ce) Cot Cerlum (Ce) Cot Cerlum (Ce) Cot Cerlum (Ce) Cerlum | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 20.0 Nitric Acid Cerlum (Ce) 20.0 Nitric Acid Cerlum (Ce) 20.0 Nitric Acid Cermulated By: Lawrence Barry (mL) 1000 5E-05 Batance Uncertainty Cot Cermulated By: Pedro L. Rentas Cermulated By: Pedro L. Rentas Cermulated By: Pedro L. Rentas Cermulated to (mL): 1000.12 0.058 Peart Incorporated Cermulated By: Pedro L. Rentas Cermulated By: Cermulated By | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Batance Uncertainty Color Co | Lot # | Lot # | Lot # | |
| Lot # | Lot # | Lot # Lot # Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certium (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 GUTB SE-05 Balance Uncertainty Good 45 Section Control | Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas Pedro L. Ren | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas Pedr | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas Pedr | Lot # | Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Meviewed By: Pedro L. Rentas Pedro L. R | 255 |
| Lot # | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Sel-05 Balance Uncertainty Pedro L. Rentas Pedro | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Pedro L. Rentas | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 5E-05 Balance Uncertainty Fevlewed By: Pedro L. Rentas | Lot # Lot # | Lot # | 255 |
| Lot # Lot # | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 SE-05 Balance Uncertainty SE-05 Balance Uncertainty Reviewed By: Pedro L. Rentas | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Mubient (20 °C) 1000 SE-05 Balance Uncertainty SE-05 Balance Uncertainty Section 1000 Secti | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Mubient (20 °C) 1000 5E-05 Balance Uncertainty Feviewed By: Pedro L. Rentas | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) (mL) (mL) | Lot # Lot # Solvent: 21110221 Nitric Acid Permulated By: Lawrence Barry (mL) Selection (mL) Sele | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) (mL) (mL) Eviewed By: Pedro L. Rentas Eviewed By: Pedro L. Rentas | Lot # | 0.000 |
| 57058 Solvent: 21110221 Nitric Acid 020623 2% 20.0 Nitric Acid Formulated By: Lawrence Barry 020626 Ambient (20 °C) (mL) (mL) Minimal Acid Formulated By: Lawrence Barry 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Fedro L. Rentas Fedro | Lot # Solvent: 21110221 Nitric Acid Centum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Fedro L. Rentas Fedro | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 20.0 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Fedro L. Rentas Fedro L. | Lot # Solvent: 21110221 Nitric Acid Centum (Ce) 2000 Nitric Acid Centum (Ce) 2% 20.0 Nitric Acid Comulated By: Lawrence Barry (mL) Complement (20 °C) 1000 5E-05 Balance Uncertainty Centum (Ce) Centum (C | Lot # | Lot # | Lot # | |
| Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Baviewed By: Packed By: P | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Packin Barriage By: Packin | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Packin Barriage By: Packin | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Pacin Barry Pacin Barry Pacin Pacin | Lot # Solvent: 21110221 Nitric Acid Perfum (Ce) 20.0 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Pedro Barry Barry Pedro Barry Pedro Barry Pedro Barry | Lot # | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Beviewed By: Pedro I Barries | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Pedro I Barries Pedro I B | |
| Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Comulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 SE-05 Balance Uncertainty SE-05 Balan | Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Innortainty Column (Ce) Column (Ce | Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Innortainty Column (Column | Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) SE-05 Balance Innortainty SE-05 B | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Ilmentation Column Colu | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) SE-05 Balance Innortainty | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Ilineatainty Colline C | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Colline Collin | The state of the s |
| Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 SELOF SHITTER SE | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 SELATE Cerlum (EA) Solvent: 21110221 Nitric Acid Formulated By: Lawrence Barry (mL) Selating SELATE Solvent: 21110221 Nitric Acid Formulated By: Lawrence Barry (mL) Selating S | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 End of the Barry (mL) En | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 SELOF SHITTER SOLVENT: 21110221 Nitric Acid Formulated By: Lawrence Barry (mL) SELOF SHITTER SELOF SHITTER SOLVENT: 21110221 Nitric Acid Formulated By: Lawrence Barry (mL) SELOF SHITTER SELOF SHITTER SELOF SHITTER SELOF SHITTER SOLVENT: 21110221 Nitric Acid Solvent: 21110221 Nitric | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Min REAR EAST Certum (Co) 1000 EAST Certum (Ce) Certum (C | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 EFAR E | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 61 TP E. A. E. E | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 1000 E. D. B. D. B | |
| Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Cerlum (20 °C) 1000 100 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Composition (20 °C) 1000 Cerlum | DE CONTRACTOR DE |
| Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) (mL) Cerlum (Ce) Ce | Lot # Solvent: 21110221 Nitric Acid Centum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) (mL) Centum (Ce) Ce | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Companies (mL) Companies | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Min (Column (Colu | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Min (Column (Colu | |
| 57058 Solvent: 21110221 Nitric Acid 020623 2% 20.0 Nitric Acid Formulated By: Lawrence Barry 020626 (mL) (mL) Ambient (20 °C) Mind (20 °C) M | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 Minute (20 °C) 1000 Minute (20 °C) Minute (20 °C) 1000 Minute (20 °C) Minute (20 °C) 1000 Minute (20 °C) Minute (20 | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 Minute (20 °C) 1000 Minute (20 °C) Minute (20 °C) 1000 Minute (20 °C) Minute (20 °C) 1000 Minute (20 °C) Minute (20 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) (mL) | Lot # Solvent: 21110221 Nitric Acid | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Min (Column (Colu | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Min (Column (Colu | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | E |
| 57058 Solvent: 21110221 Nitric Acid Ambient (20 °C) Nitric Acid Formulated By: Lawrence Barry | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 Certum (Certum (Ce) Certum | Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 Certum (20 °C) Ce | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 Minute (20 °C) Minute (20 | |
| Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 | |
| Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Mind Acid Mind Acid | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Mind Acid Cerlum (| Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Minus (mL) Mi | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Minus (mL) Mi | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Minus (mL) Mi | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Minus (mL) Mi | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) (mL) Cerlum (20 °C) Ce | Lot # | |
| 57058 Solvent: 21110221 Nitric Acid 020623 2% 20.0 Nitric Acid 020626 (mL) Formulated By: Lawrence Barry | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) (mL) Formulated By: Lawrence Barry | Lot # Solvent: 21110221 Nitric Acid Solvent: 21110221 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) | Lot # Solvent: 21110221 Nitric Acid Solvent: 21110221 Nitric Acid Solvent: 21110221 Nitric Acid | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Min (20 ° | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Companies | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Minute (2 | 2 |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) (mL) Ambient (20 °C) Ambient (20 °C) (mL) Ambient (20 °C) | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Converse Convers | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Converse Convers | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Color Co | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Color | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Control of the contr | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Control of the contr | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Control of the control of t | |
| Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Control # Control | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Colvent (20 | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Control # Contro | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Color | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Color | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) Ambient (20 °C) Solvent: 21110221 Nitric Acid Formulated By: Lawrence Barry Formulated By: Lawrence By: Lawre | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Converse C | |
| Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Color Colo | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Cerlum (Ce) Cerlum (Ce) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Cerlum (Ce) Cerlum | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Cerlum (Ce) Cerlum | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Cerlum (Ce) Cerlum | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Color Co | Lot # Solvent: 2110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Color Col | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) Ambient (20 °C) Ambient (20 °C) Cerlum (Ce) Cerlum | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20.0) (mL) Ambient (20.0) (mL) Ambient (20.0) (mL) (| Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20.0) (mL) Ambient (20.0) (mL) Ambient (20.0) (mL) (| Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20.0) (mL) Ambient (20.0) (mL) Ambient (20.0) (mL) (| Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20.0) (mL) Ambient (20.0) (mL) Ambient (20.0) (mL) (| Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20.0) (mL) Ambient (20.0) (mL) Ambient (20.0) (mL) (| Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20.0) (mL) (mL) Cerlum (Ce) C | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20.0) | |
| Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Solvent: 21110221 Nitric Acid Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Solvent: 21110221 Nitric Acid Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Cerlum (Ce) Cer | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid (mL) Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid (mL) Formulated By: Lawrence Barry (mL) | Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerium (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | |
| Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | 200623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | Lot # Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (ml.) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (ml.) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (ml.) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (ml.) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (ml.) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (ml.) | Lot # Solvent: 21110221 Nitric Acid | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (ml.) | |
| 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (m) | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 02020 |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 60600 |
| 57058 Solvent: 21110221 Nitric Acid Certum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Berry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Berry | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: awrence Berry | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: awrence Berry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: awrence Berry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Berry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Berry | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Berry | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20 Nitric Acid Exemulated But | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20 | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20 0 Nitric Acid | 57058 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) 2% 20.0 Nitric Acid | 57058 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20 0 Nitric Acid | 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20 Nitric Acid | 57058 Solvent: 21110221 Nitric Acid Cerium (Ce) 2% 20 Nitric Acid | 57058 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20 Nitric Acid | |
| 57058 Solvent: 21110221 Nitric Acid Cerlum (Ce) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerium (Ce) | 57058 Solvent: 21110221 Nitric Acid 020623 Cerium (Ce) | Name of the Party |
| 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | |
| 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | |
| 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | |
| 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | |
| 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | |
| 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 5705 <u>8</u> 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | |
| 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 5705 <u>8</u> 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | 57058 020623 Cerlum (Ce) | |
| 57058 020623 Coding (Co) | 57058 020623 Coding (Co) | 57058 020623 Coding (Ca) | 57058 020623 Coding (7a) | 57058 020623 Certing (Ce) | 57058 020623 Corturn (Ca) | 57058 020623 Continu (Co.) | 57058 020623 Codium (Co) | |
| 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | |
| 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | |
| 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 5705 <u>8</u> 020623 | 5705 <u>8</u> 020623 | 57058 020623 | |
| 57058 | 5705 <u>8</u> 020623 | 5705 <u>8</u> 020623 | 5705 <u>8</u> 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | |
| 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | 57058 020623 | |
| 57058 | 57058 | 57058 | 57058 | 57058 020623 | 57058 020623 | 57058 | 57058 | |
| 57058 | 57058 | 57058 | 57058 | 57058 020623 | 57058 Danesa | 57058 | 57058 | |
| <u>57058</u> | <u>57058</u> | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | |
| 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | |
| 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | |
| 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | |
| 57058 | 57058 | 57058 | 57058 | <u>57058</u> | <u>57058</u> | 57058 | 57058 | |
| 57058 | 57058 | <u>57058</u> | <u>57058</u> | <u>57058</u> | <u>57058</u> | 57058 | 57058 | |
| 57058 | <u>57058</u> | <u>57058</u> | <u>57058</u> | 57058 | 57058 | 57058 | 57058 | |
| 57058 | 21058 | 21058 | 57058 | 57058 | 57058 | 57058 | 57058 | |
| 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | The same of the sa |
| 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | |
| 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | 57058 | The state of the s |
| 57058 | 852058 | 85025 | 57058 | 57058 | 57058 | 82028 | 57058 | |
| 52058 | 82025 | 82028 | 57058 | 57058 | 57058 | 57058 | 82029 | |
| 57059 | 67059 | 67058 | CZOKB | CZOKB | 57058 | 57058 | 67059 | |
| FAMES | 03063 | 03063 | 03063 | FTAREO | CTAKEO | 03063 | 03063 | |
| o de la constanta | o de constante | | | | o de la companya de l | o de la companya de l | | |
| | | | | | | | | |
| | | | | | | | | 01000 |
| | | | | The control of the co | · · | · | | |
| | | | | | | | | |
| Lot* | Lot# | Fot# | #10T | ************************************** | | | Lot# | |
| Lot* | Lot* | Fot # | #10T | #10*] | | - Tot * | Fot # | |
| Lot* | Lot* | Fot# | #10T | **10*] | *10T | Fot # | Lot # | |
| Lot* | Lot* | #10T | *10T | *10T | Total Total | Tot # | Tot# | |
| #10T | # TOT | #10T | ************************************** | 100 | Total Total | Total | Lot* | |
| *************************************** | ## TOT | *************************************** | 100 | 101 | Tot# | , Total | | |
| *************************************** | *************************************** | *************************************** | | | |) | | |
| #1001 | ************************************** | ************************************** | *************************************** | | | | | |
| 41 C | 418 | | | | 1 | | | |
| #** | | 3 | 1 | 1 | 1 | | | |
| **** | 7 | *** | 1 | | | | | |
| 74 | | 1 | 194 | | | | | |
| | H-V- | | | 1 | | | | |
| | | | | | | 5 | | |
| | | |) | • | 5 | 5 | | |
| | | | | | | | | 1000 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| Compound | RM# | Lot Number | Nominal Conc. (vg/mL) | (%) | Purity Uncertainty Assay (%) Purity (%) (%) | Assay (%) | Target Weight (g) | Actual Weight (g) | Actual Actual Uncertainty Weight (g) Conc. (ug/mt.) +/- (ug/mt.) | Uncertainty +/- (ug/mL) | SS | (Solvent Safety Info. On Attached pg.) CAS# OSHA PEL (TWA) LD50 | ched pg.) LD50 | NIST |
|---------------------------------|---------------|----------------|---|-------|--|--------------|----------------------|----------------------|--|----------------------------|-------|---|-------------------|---------------|
| Cerium nitrate hexahydrate (Ce) | IN146 | IN146 Z512CEB1 | 1000 | 88.98 | 0.10 | 32.8 | 3.04919 | 3.04921 1000.0 | 1000.0 | 20 | II == | ¥. | ď Z | ĄN |
| [1] Spectrum N | lo.1 [43.472 | sec]:58158.D# | [1] Spectrum No.1 [43.472 sec]:58158.D# [Count] [Linear] | | | | | | | | | | | $\ \cdot \ $ |
| 1.0£9_ | | | | | | | | | | | | | | |
| 1 1 | | | | | | | | | • | | | | | |
| 5.068 | | | | | | | | | | | | | | |
| 111 | * | | | | | | | | | | | | | |
| m/2-> | 10 | 20 | 30 | | 40 | | 50 | 9 | 70 | | 80 | 100 | | |
| 2.056 | | | | • | | | | | | | | | | |
| -1-1 | | | | • | | | | | | | | | | |
| 1.056 | | | | | | | | | | | | ν, | | |
| 1-1 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| m/2-> | 110 | 120 | 130 | 0 | 140 | | 150 | 160 | 170 | | 180 | 190 200 | | |
| 5.067 | | | | ; | | | | | | | | | | |
| • • | | | | | | | | | | | | | | |
| 2.5£7 | | | | | | | | | | | | | | |

250

240

220

210

Printed: 2/6/2023, 2:46:41 PM

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):

| | | ~1 | - 2 | - 2 | | ~ | 7 |
|--------------|-------|--------------|-------|----------|---------------|---------------|-------|
| | <0.0> | Z0:02 | <0.02 | <0.05 | 20:0× | ,0,0> | 20.0≥ |
| | * | ח | Λ | Yb | > - | Zn | Z |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 20.0 ≥ | <0.02 |
| | a. | Te | E | Ę | Tm | Sn | Ħ |
| | 40.2 | <0.02 | <0.02 | <0.7 | <0.02 | <0.02 | <0.02 |
| | S | S. | Ag | Na | Š | S | Ē |
| /mL) | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| , (ид) | 占 | 8 | 뙲 | 82 | Ru | Sm | S |
| by ICP-MS | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.2 |
| | ï | S | ő | Pd | а, | 굺 | 24 |
| Verification | <0.02 | <0.02 | €0.01 | <0.02 | 402 | <0.02 | <0.02 |
| letals | 17 | 7 | Mg | Mn | Hg | Mo | R |
| Trace M | <0.02 | <0.02 | <0.02 | <0.02 | 8 | ₹0.02 | <0.02 |
| | H | Но | ű | ᆈ | Fe | Ľ | £ |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 40.02 | <0.02 |
| | Š | ঢ় | 昂 | 3 | රී | පී | Au |
| | <0.02 | Q .2 | H | ₩ | <0.02 | <0.02 | <0.02 |
| | 3 | ౮ | ප | ర | ඊ | රි | ਰੋ |
| | <0.02 | ₹0.05 | Ø.2 | ₹0.02 | Q .01 | <0.02 | <0.02 |
| | IA | Se | As | Ba | æ | 2 | m |

Physical Characterization:

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

(T)= Target analyte

My J. M.

Certified by:

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

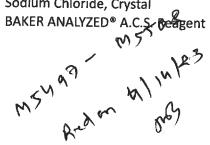
^{*} Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

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

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

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

Sodium Chloride, Crystal







Material No.: 3624-01

Batch No.: 0000281938

Manufactured Date: 2021-06-07

Retest Date: 2026-06-07

Revision No.: 2

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 NO₃) | ≤ 0.003 % | < 0.001 % |
| ACS - Phosphate (PO ₄) | ≤ 5 ppm | < 5 ppm |
| Sulfate (SO ₄) | ≤ 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



Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

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

Part # 58024



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

| | | | _ | | | | _ | | | = |
|---------------|--------------|------------------|-----------|--------------|--------------|--------------|-------|--|--------------|---|
| | B | ᄧ | Ве | В | As | Sb | Δ | Monthly | | |
| | A).02 | 4 0.02 | 0,01 | A .02 | 40.2 | △0.02 | △0.02 | | | |
| | δ | පි | Ω | င္တ | දි | ర్జ | Ω | | | |
| | 40.02 | 40.02 |) | 40.02 | 40.02 | 40,2 | △0.02 | | | |
| | Æ | ဂ္ဂ | වූ | ନ୍ଥ | 멸 | 녆 | Dy | 80 | | |
| | 40.02 | 40.02 | 40.02 | <0.02 | 40.02 | 40.02 | 40.02 | mineral differences | | |
| | 3 | Ľ | स्र | Ħ | ď | ᅜ | Ж | SHEET STATES | | |
| | 40.02 | 40.02 | 40.2 | A).02 | <0.02 | 40.02 | 40.02 | | I race M | 1 |
| | 폺 | Мо | В. | Ķ | ВМ | Ē | П | MISSON ISSUE | Metals | 1 |
| 3 | A0.02 | 40.02 | 40.2 | 40.02 | 40,01 | ∆ .02 | 40.02 | SI RECEIPTOR | Verification | |
| Towns and the | ~ | ን | 70 | 2 | ô | ₹ | 3 | SHEWNING. | Clon | - |
| | ∆ 0.2 | 40.02 | 40.02 | 40,02 | 40.02 | 40.02 | 40.02 | THE PARTY OF THE P | by ICP-M | |
| | Sc | Sm | 잗 | 공 | Rh | æ | Pr | | S (Hi | 5 |
| | <0.02 | <0.02 | <0.02 | 40.02 | 40,02 | 40.02 | <0.02 | | g/mL) | |
| | Ta | S | ñ | Z. | Ąg | Si. | Se | | | |
| | 40.02 | <0.02 | 40.02 | 402 | 40.02 | 40.02 | 402 | | | |
| | == | Sn | Tm | Ħ | ᄇ | 급 | 176 | | | |
| | 40,02 | 40.02 | 40,02 | 40,02 | <0.02 | 40,02 | <0.02 | Contract Contraction | | |
| | Zr | Zn | ~ | 뀱 | ۷ | Ϥ | W | 「「「ない」 | | |
| | <0.02 | < 0.02 | <0.02 | <0.02 | 40.02 | △0.02 | <0.02 | SALES OF SALES | | |

(I)= larget analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

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

57082 100923 Lead (Pb)



Certified Reference Material CRM

MSTHT

R: 12/20/23

Lot #

Solvent: 24002546 Nitric Acid

2% 60.0 Nitric Acid

1000 Ambient (20 °C)

Recommended Storage:

Expiration Date:

100926

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

Lot

Nominal

Purity

Uncertainty Assay

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

OSHA PFL (TWA)

LD50 OSHA PEL (TWA) SRM

Formulated By: Lawrence Barry 100923

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

| | | ÷ |
|-------|-------------------|---------------------------------------|
| 1.055 | | 1. Lead(II) nitrate (Pb) |
| | [1] Spectrum No.1 | IN029 PBD122016A1 |
| | 14.144 | 1000 99.999 0.10 62.5 4.80071 4.80077 |
| | 8ec]:58 | 88.88 |
| | 082.D | 0.10 |
| | #[Cou | 62.5 |
| | nti [Line | 4.80071 |
| | | 4.80077 |
| | | 1000.0 |
| | | 2.0 |
| | | 10099-74-8 |
| | | 0.05 mg/m3 |
| | | intryns-rat 93 mg/kg |
| | | 3128 |
| | | |

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

Printed: 12/19/2023, 3:36:21 PM





| - | יַ ע | ָבָּי. לָ | # t | ਲੂ ; | As | dS | 2 | | | |
|-------|-------|-----------|--------------|----------|------------|--------------|--------------|-------------------------|----------|---|
| 70.02 | 3 6 | 3 5 | 201 | 3 6 | 3 | & 20.02 | 40.02 | | | |
| 1 | 3 5 | 3 5 |) د | 3 5 | <u>ئ</u> | င္မ | Ω | | | |
| 20.02 | 3 8 | 3 6 | 3 5 | 2 6 6 | 3 | 402 | 40.02 | | | |
| All | ç | 2 8 | 2 8 | 5 5 | i l | | Дy | | | |
| 20,02 | 2002 | 20.02 | 20.02 | 2002 | 600 | A 007 | 40.02 | desire est no mestifica | | |
| 3 | 1 7 | ¹ দ্ধ | 1 15 | · 5 | 1 2 | 5 | HH | | _ | ا |
| l-i | 20.02 | A) 12 | 40,02 | 20.02 | 2002 | 3 | 50.02 | | race Me | |
| Z | Mo | H9 | M | <u>M</u> | ` <u>[</u> | 7 | E | i | tals | - |
| 40,02 | 40.02 | 40.2 | △0.02 | 10.0 | 2002 | 3 | 40.02 | | Verifica | |
| K | 7 | 7 | P | Ç | N | 1 | Z | | tion | ١ |
| 402 | <0.02 | 40.02 | 40.02 | 40.02 | 20.02 | | 40.02 | | by ICP-I | |
| Sc | Sm | R | 중 | 꺔 | 8 | : | Ŗ | | S S | ı |
| <0.02 | <0.02 | <0.02 | <0.02 | 40.02 | 20.02 | 000 | 40.02 | ľ | ig/mL) | |
| Ta | S | Ş | Z | ₽ | 2 | : 8 | S. | | | ı |
| 40.02 | 40.02 | 20.02 | 402 | 40.02 | 40.02 | 201 | Ano | | | |
| Ti | Sh | Tm | Ħ | Ħ | Te | 5 | | | | |
| 40.02 | 40.02 | △0.02 | ₫.02 | 40.02 | 40.02 | 20.02 | 3 | | | |
| Zr | Zn | × | 44 | ۷ | c | 4 | W | | | |
| ₫,02 | 40.02 | ₫.02 | △0.02 | 40.02 | 40.02 | 20.02 | 2003 | | | |

Physical Characterization:

(1)= Target analyte

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

Certified by:

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

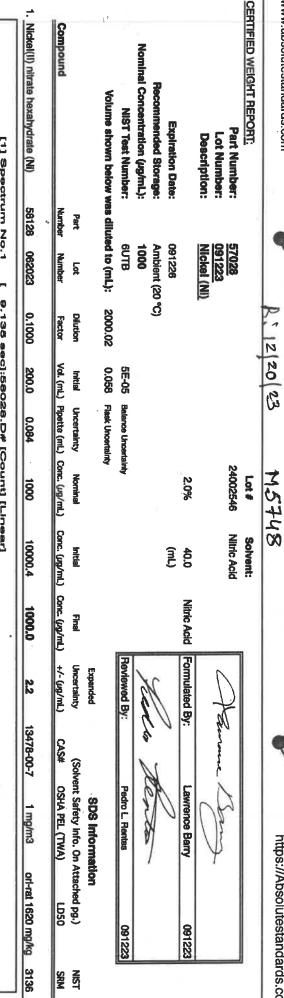
the preparation of all standards.

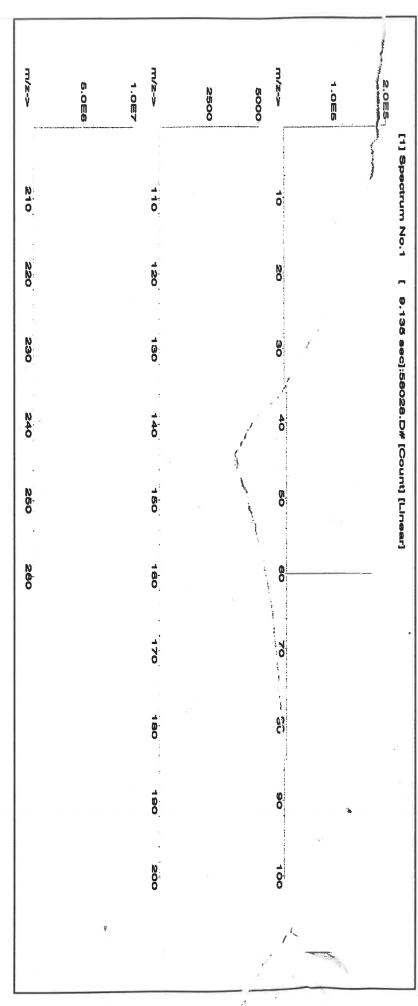
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions.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

Certified Reference Material CRM



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





800-368-1131

Absolute Standards, Inc.

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

| | 1 | - | | - | - | | - | - | | - | - | T | 9 | | = |
|----------|-------|---------------|--------------|---------------|-------------|---------------|---------------------|--------------|--------------|-------|------------|--------------|----------|----------|---|
| | | В | 10 | <u> </u> | Be | Ba | 1 | As | 30 | 3 | 2 | | ı | | |
| | | 40.02 | 2000 | 5 | <u>8</u> | 20,02 | | 40.2 | 70.02 | 3 | 0.02 | | | | |
| | | ව | S | · · | 2 | S | . 8 | څ - | 2 | , | 2 | | | | |
| | | ₫.02 | 20,02 | | A | ∆ 0.02 | 20.02 | 3 | A 0.2 | | AMA | | | | |
| | | Αu | ڇ | Ş | ₽ - | 2 | 2 | ľ | Ę | 5 | 7 | | | | |
| | | ∆ 002 | <0,02 | 20.02 | 3 | 602 | 70,02 | 3 | A),02 | 20.02 | 2000 | | | | |
| | Ì | 3 | 7 | 17 | <u>F</u> | <u>-</u> | In | 7 | 뚱 | 111 | Ę | THE SAME | | | |
| | | ∆ 0.02 | 0.02 | , C | 3 | <u> </u> | 20.02 | 3 | <u>&</u> | 20.02 | 2000 | | I acc is | 200 | |
| | | Z. | ₹ | 200 | 7 1 | ¥ | Z. | | Ε. | 5 | | | Icrais | 0+0 | |
| 3 | | \$ | 8 | 2.0 | 200 | A | <u>0.01</u> | | A)(2) | 20.02 | 200 | | ACTILICA | | |
| Target | r | * | 7 | he | , ; | 론 | S | , ; | Ş | 2 | | ı | | <u>†</u> | I |
| arialyte | 1 | 3 | A | 40,02 | 20.02 | 3 | <0.02 | 2000 | 200 | Н | | | DY ICE-N | 7: 53 P | |
| | ۶ | 9 - | î | R | 2 | ş | 곧 | 7 | 9 | 7 | | | 20 | 0 | |
| • | 20.02 | 3 6 | A 3 | ∆ 0.02 | 20.02 | 3 | & 80 80 80 | 70.02 | 3 | ۵.02 | | ľ | 9/mL) | / | |
| | I a | 3 6 | ^ | ş | N | 1 | Αg | 2 | ? | જ | | ı | | | |
| | 20,02 | 68 | 3 | <u>&</u> | 8 | > 1 | A | 20.02 | 3 | 40.2 | AND TOWN | MICHIGAN NO. | | | |
| | | 1 1 | ? | ď | Th | 1 : | -1 | Ie. | 3 | 7 | | | | | |
| | 40,02 | 20.02 | 3 | 40.02 | 40.02 | 6.01 | 3 | 20.02 | 100 | 4000 | | | | | |
| | 72 | 4 | ₹, | <u> </u> | 5 | • | < | _ | : : | Ø | N. Control | | | | |
| | <0.02 | 20.02 | 600 | 3 | 6002 | 20:02 | 3 | ∆ .02 | 200 | 2000 | | | | | |

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM R:8/25/23

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

CERTIFIED WEIGHT REPORT: Part Number: 58029 071723 Lot # Solvent:

21110221 Nitric Acid

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

> (mL) 40.0

> > Nitric Acid

Formulated By:

Benson Chan

071723

Description: Lot Number:

Compound Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): NIST Test Number: Number Part **BTU9** 1000 Number Lot 2000.02 Dilution Factor Vol. (mL) 5E-05 0.058 Initia Flask Uncertainty Balance Uncertainty Pipette (mL) Conc. (µg/mL) Uncertainty Nominal Conc. (µg/mL) Conc. (µg/mL) Final Reviewed By: +/- (µg/mL) Uncertainty Expanded CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) Pedro L. Rentas SDS Information LDS0 071723

Copper(II) nitrate trihydrate (Cu)

58129

022723

0.1000

200.0

0.084

1000

10000.5

1000.0

22

10031-43-3

1 mg/m3

ori-rat 794 mg/kg

3114

SRM TSIN

| m/z-> | 1.007 | 2.0∈7 | m/z-> | 20.5 E7 | 5.0E7 | 5.OE5 | 1.0E6 |
|-------|-------|-------|-------|------------|------------|-------|-------|
| | | | | | : | | |
| 210 | | | 110 | | 0 | | |
| B) | | | | | | | |
| 220 | | | 120 | | 0 | | |
| 230 | | | 130 | | 3 0 | | |
| 0 | | | 0 | | | | |
| 240 | | | 4.0 | | 6 | | |
| ħ) | | | | | | | |
| 250 | | | 150 | | 0 | | |
| 200 | | | 160 | | 0.0 | | |
| 0 | | | | | - | | |
| | | | 170 | | 70 | | |
| | | | -4 | | m | | |
| | | | 0 | | 80 | | |
| | | | 190 | | 00 | | |
| | | | | | • | | |
| | | | 200 | | 100 | | |

Part # 58029

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

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

(I) = larget analyte

Physical Characterization:

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

Certified by:

2 of 2

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

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

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

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

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



Certified Reference Material CRM



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

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

24002546 Nitric Acid

2.0%

Nominal Concentration (µg/mL):

NIST Test Number:

BTU₉ 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

Expiration Date:

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

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





800-368-1131



Certified Reference Material CRM

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

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

(T) = Target analyte

Physical Characterization:

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

Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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

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

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

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

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

122



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

CERTIFIED WEIGHT REPORT:

Part Number: Description: Lot Number: 57050 071123 Tin (Sn)

Salvents: 21110221

Nitric Acid Hydrochloric acid

Lot #

22D0562008

Nominal Concentration (µg/mL): Recommended Storage: **NIST Test Number:** Expiration Date: 1000 Ambient (20 °C) 071126

Weight shown below was diluted to (mL): **BTU9** 499.93

RM#

Number

Conc. (µg/mL) Nominal

(%)

Uncertainty Assay
Purity (%) (%)

Weight (g)

Target

ρţ

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> 10.0 30.0

3 6%

Nitric Acid

Formulated By:

Benson Chan

071123

Hydrochloric acid

Reviewed By:

Pedro L. Rentas

071123

| Weight (g) | ACTUAL | |
|--------------------------|--------------------|-------------|
| Conc. (µg/ml.) | Actual Ur | |
| '- (µg/mL) | certainty | xpanded |
| CAS# OSHA PEL (TWA) LD50 | (Solvent Safety | SUS |
| PEL (TWA) | y Info. On Attache | Information |
| LD50 | d pg.) | |
| SRM | TSIN | |

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

Part # 57050

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

| | Al Shaper | |
|-------------------|---|-----------|
| | 4000 4000 4000 4000 4000 4000 4000 400 | |
| | | |
| | 58555 | ı |
| | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | |
| | A C C C E E P | |
| | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | |
| | HH Ho Hr Fe | |
| | 4002 4002 4002 4002 4002 4002 | Irace N |
| | Mo Min Li | 1etal: |
| e1 = U | 40.02 40.02 40.02 40.02 40.02 | s Verific |
| T) = Tamet anak/a | × 7 × 8 8 8 × 1 | ation |
| | 44444 | by CP- |
| | S R R R R P | 7) SM |
| | 40.02 40.02 40.02 40.02 40.02 | Ja/mL) |
| | Z S Z Z S | |
| | 40.02 40.02 40.02 40.02 40.02 40.02 | |
| | T T T T T | |
| | 40.02 40.02 40.02 40.02 40.02 | |
| | \$ > > \$ × £ 5 | |
| | 000 000 000 000 000 000 | |

(I) = larget analyte

Physical Characterization:

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

Certified by:

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

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

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

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

Certified Reference Material CRM

R: 02109124





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

| | | | | | | TANK BURNE | 10000 | CHICAGO CONTROL CONTRO | URCH LABILLY | ianioc) | (Solvent Safety Into, On Attached pg.) | rttached pg.) | 202 |
|---|--------|--------|-----------|-----------|----------------|--|---------------|--|--------------|------------|---|--|------|
| Compound | Number | Number | Factor | Vol. (mL) | Pipette (mL) C | conc. (ug/ml.) | Conc. (µg/mL) | Conc. (ug/ml.) | +/- (ng/mL) | CAS# | Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) | 1050 | SRM |
| | | | | | | | | | | | | | |
| Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0 | 58127 | 050923 | 0.1000 | | 0.084 | 1000 | 10000 | 100001 100001 | 9.0 | 10008.000 | 000 | 700 | |
| | | | | | | | 20000 | | 7:5 | 100c0-22-9 | O.UZ ING/ITIS | STEE 10020-22-9 0.02 mg/ms on-rat 691 mg/kg 3113 | 3113 |
| | | | | | | | | | | | | | |
| 2000 | Z Ezz | 1.0 | 9 4 0 4 G | Cau. Co | CHARLE WAS | [1] Specifical No.1 Cat. 04.04% pool: nacotation of the partition of the p | | | | | | | |

| 1.0E6 | 5.0E5 | m/z-> | 5.0E7 | 1.0E8 | 5.0E7 |
|---|-------|------------|-------|-------|-------|
| | | | | F | |
| | | .0 | | 0 | |
| | | 0 | | 120 | |
| L 34-243 Secj.baok7.D# [Count] [Linear] | | Ō | | 130 | |
| | | .0 | | 140 | |
| | | .09 | | 150 | |
| | | . O | | 160 | |
| | | | | 170 | |
| | | 02 | | | |
| | | 80 | | 160 | |
| | | 00 | | 180 | |
| | | 100 | | 200 | |

Lot # 091923

250

240

230

220

010

W/Z->

Certified Reference Material CRM





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

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

| | | | | | | | Trace M | etals | Verifical | tion | by ICP-M | 4S (F | ig/mL) | | | | | | |
|----|--------------|----|---------------|----|----------------|----|--|------------------|---|--------|---------------|---------|-----------------|------------------------|---------------------|----------------|-------|---------------------|-----------------|
| 1 | | | | | | | STREET, STREET | No section lives | ALL DESCRIPTION OF THE PERSON | 10.000 | Market Mark | MINNSH. | San Salar Salar | NAME OF TAXABLE PARTY. | Service of the last | SECOND STATES | | THE PERSON NAMED IN | STREET, SQUARE, |
| IV | <0.02 | ಶ | 1 | Š | 40.02 Dy 40.02 | Ħ | <0.02 | П | <0.02 | Z | <0.02 | Æ | <0.02 | B | <0.2 | £ | <0.02 | A | <0.02 |
| ౙ | 40.02 | రే | 40 7 | 占 | <0.02 | H9 | <0.02 | .3 | ₹005 | Ź | ₹0.02 | 2 | <0.02 | Š | 40.02 | T _e | 40.05 | ם | 40.02 |
| As | Q 5 | ප | 40.02 | 呂 | 40.02 | ų | <0.02 | Mg | 10.05 | ඊ | ₹0.02 | 됩 | <0.02 | Ag | 40.02 | F | <0.02 | > | Ø.02 |
| 쯃 | 40.02 | చ | 40.02 | 3 | 4002 | ㅂ | <0.02 | Ma | <0.02 | 콘 | ₹000 | 2 | 40.02 | N _a | 40.2 | Ę | 20:0> | Ŗ | Ø.02 |
| 2 | ¥0.01 | ඊ | 20.0 2 | පී | 40.02 | હ | 40.2 | 쁀 | \$ 20 | م | ₹0.02 | 콥 | 40.02 | Şt | 40.02 | Tm | Ø.02 | 7 | Ø.02 |
| 遥 | 40.02 | රි | ۳ | Ğ, | 4002 | ដ | <0.02 | Mo | 40.02 | Æ | 20'0 > | S | <0.02 | S | 40.02 | Sn | 40.02 | Zn | Ø.02 |
| æ | <0.02 | ට් | <0.02 | Αn | <0.02 | 윤 | Z0'0> | P | <0.02 | м | 40.2 | S | <0.02 | Fee Fee | 40,02 | Ħ | Ø.02 | 72 | Ø.02 |

(T)= Target analyte

Physical Characterization:

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



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



Lot # 091923

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

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



02/00/24 Certified Reference Material CRM

W 580



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

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

1. Arsenic (As)

58133

020522

0.1000

400.0

0.084

1000

10001.0

1000.0

2.0

7440-38-2

0.5 mg/m3

orl-rat 500 mg/kg 3103a

Number Part

Number Lot

Vol. (mL)

Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/ml.) Uncertainty Expanded

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

LD50

NIST SRM

SDS Information

111323

111323

Dilution Factor

initial

Uncertainty

Nominal

Initial

Final

Compound

Volume shown below was diluted to (mL):

4000.0

0.06

Flask Uncertainty

| -z/x-> | 500 | m/z-> | N IN IN | m/z-> 5.0≣4 | 1.0厘5 | ≥.005 |
|------------------|-----|----------|---------------|--|-------|---|
| | | | | | | 3 |
| Ŋ | | 110 | | ō | | [] Speatrum No.1 |
| | | | | | | Z 0.1 |
| N N N O | | 120 | | N. | | á |
| 230 | | 130 | | 3 0 | | [34.433 sec]:57033.D# [Count] [Linear] |
| | | A second | | er West A best | | 90]:570 |
| 240 | | 140 | | ò | | 33.D# |
| N 0 | | -i- | | 50 | | [Count] |
| Ö | | 0 | | 0 | | [Lines |
| N O | | 160 | | 0.0 | | ā |
| | | | | | | |
| | | 170 | | 70 | | |
| | | 180 | | 80 | | |
| | | - | | The state of the s | | |
| | | 190 | | 90 | | |
| | | N | | | | |
| | | 200 | | 100 | | |

Part # 57033

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

| | - H H H > /0 > | 8 | - |
|----------------|---|-------------|---|
| | As Sb Ba Bi Bi | | |
| | 4002 4002 4002 4002 4002 | | |
| | 5 8 ជ ង 8 ជ ប | | |
| | 402 402 402 402 402 402 | | |
| | ₹ ७८८ = = ⊅ | | |
| | 6000 6000 6000 6000 | | |
| | 322428 | | |
| | 40.02 40.02 40.02 40.02 40.02 | Trace N | |
| | N H M L L | letals | |
| 9 | 40.2 40.2 40.2 40.2 40.2 | Verifica | |
| = Target | M R P B O R R | E S S | |
| Target analyte | 40.02 40.02 40.02 40.02 | by ICP-N | |
| | S R R R R R | id) St | |
| R | 4444 444 444 444 444 444 444 444 444 4 | g/mL) | |
| | Ta Sr Na Sc | | |
| | 40.2 40.2 40.2 40.2 40.2 40.2 | | |
| | ###################################### | | |
| (+) | 40.02 40.02 40.02 40.02 40.02 40.02 | | |
| | Z Z Y Z < C & | | |
| | 40.02 40.02 40.02 40.02 40.02 | | |

Physical Characterization:

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

Certified by:



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

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

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

Part # 57033

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

Solvent: MKBQ8597V Ammonium hydroxide

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

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

Part Number: Lot Number: 57005 071123

Description: Boron (B)

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

Expiration Date:

071126

2.0%

Ammonium hydroxide

Formulated By:

Benson Chan

071123

tento

40.0

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

RM#

Number

Purity (%)

3

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

071123

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

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

NIST SRM

Weight (g) Conc. (µg/mL)

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

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

180

190

200

80

90

100

Part # 57005

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

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

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

| | B B B B AS | | |
|--|---|----------|--|
| | 40.02 40.02 40.02 40.02 | | |
| | 585855 | | |
| | 40.02 40.02 40.02 40.02 40.02 | | |
| | A C C C E E E Dy | | |
| | 40.02 40.02 40.02 40.02 | | |
| | 2000年1000年1000年1000日 | ١. | |
| | 000 000 000 000 000 000 | Frace M | |
| | Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma M | etals | |
| (T) = Target analyte | 40.02 40.02 40.02 40.02 40.02 | Verifica | |
| get ana | × P P Z Q B Z | ation | |
| lyte | 40.02 40.02 40.02 40.02 40.02 | by ICP | |
| | S R R R R R | -MS (| |
| | 66888888 | //g/mL) | |
| | Ta S Na S S S S S S S S S S S S S S S S S | | |
| | 402 402 402 402 402 402 402 | | |
| | Tin | | |
| | A A A A A A A A A A A A A A A A A A A | | |
| | \$ D > \$ > \$ 4 | | |
| | 4000 4000 4000 4000 4000 | | |

Physical Characterization:

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

Certified by:

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



R1 02/09/124 Certified Reference Material CRM

M5816

CERTIFIED WEIGHT REPORT

Part Number:

Lot Number: Description:

57016 122923

Solvent:

122923

ASTM Type 1 Water

Lot #

Expiration Date: 122926 Sulfur (S)

Nominal Concentration (µg/mL): NIST Test Number: 1000

Recommended Storage:

Ambient (20 °C)

Weight shown below was diluted to (mL): 4000.0 5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Nominal

Purity

Uncertainty Assay

Target

Actual

Uncertainty

Expanded

Reviewed By:

Pedro L. Rentas

122923

tento

Formulated By:

Benson Chan

122923

 Ammonium sulfate (S) IN117 SLBR7225V Number Conc. (µg/mL) 1000 99.9 38 Purity (%) 0.10 24.3 38 Weight (g) 16.4979 Weight (g) Conc. (µg/mL) 16.4980 1000.0 +/- (µg/mL) 20 7783-20-2 CAS# SDS Information
(Solvent Safety Info. On Attached pg.)
LD50 ¥ orl-rat 4250mg/kg 3181 SRM

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

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

Part # 57016

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

(I) = larget analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Lot #

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

Formulated By:

Lawrence Barry

091123

Pedro L. Rentas

091123

SDS information

rento

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

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

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

Part # 57015

--z/m

210

220

230

240

250

260



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

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

| | ľ | В | <u> </u> | Ħ. | 뮸 | 200 | Ę, | 3 | | ş | 2 | 4 | | |
|----------------|--------------|----------|----------|---------------|---------------|---------------|---------------|--------------|----------------|---|--------------|----------------|----------|----------|
| | | A 022 | 20.02 | 3 | - 60 10 | 70.02 | 3 | 70 | | A | 2002 | 200 | | |
| ř. | | <u>ნ</u> | 8 | , | Ω | Ç | ? | g | | <u>ප</u> | 2 | 2 | | |
| | | A 23 | 20705 | 3 | A 20.02 | 20.02 | 3 | 40.02 | | 2 | 20,02 | 3 | | |
| | | A II | Ę | 1 | ට ව | 2 | 2 | 달 | 2 | Į, | Ų | | | |
| | | 3 | 40.02 | | 3 | ♦0.02 |) | 8 | 20.02 | 3 | ∆ .02 | | | |
| | | ÿ | <u>_</u> | | ₹1 | 4 | | <u> </u> | 0.0 | F . | H | 1 | | |
| | 2000 | 3 | <u> </u> | 4.4 | 3 | ∆ 02 | | 6 002 | 20.02 | 3 | 40.02 | - | | Trace M |
| | i | ž | š | 200 | Ç | ¥ | 9 | X | Į, | • | 5 | | | <u>P</u> |
| 3 | 20,02 | 3 | <u>8</u> | 7.03 | 3 | ∆ 0,02 | 1000 | <u>^</u> | 40,02 | 2 | A 0,02 | | | Verifica |
| Target | ŀ | 4 | 7 | 7 | , | Z | Ş | Ş | S | | Z | | | †: |
| Target analyte | ê | 9 | A) | _ | | 8 | 10:04 | 3 | A0.02 | | A) (2) | | 3 | אי וכפרו |
| | Se. | • | S | ¥. | , | ₽ | 2 | P | ₽ | : | Ŗ | Manager Street | F | 100 |
| | 40.02 | | A S | 40.02 | | A | 70.05 | 3 | <u>\$</u> 0.02 | *************************************** | A | | g/ IIIL) | 7 |
| | Ta | , | ^ | ş | | Z. | A | • | S | ş | ß | SANSON COM | | |
| | 40.02 | 70.02 | 3 | ∆ 0,02 | i d | 3 | 20,02 | 3 | ∆ | ć | 3 | | | |
| | 111 | ě | ? | Ĭ'n | Ē | ; | Η | ! | 7 | č | | | | |
| | 40.02 | 70.02 | 3 | ∆0,02 | 2000 | 3 | ∆ 0.02 | 2 | 200 | 20.02 | 300 | | | |
| | Zr | 2 | 7 | <u>~</u> | 16 | \$ | \ - | | 9 | * | | | | |
| | 40.02 | 20.02 | 3 | 20.02 | 70.0> | 3 | <u></u> | | A) (2) | 20.02 | | | | |

Physical Characterization:

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

Certified by:

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

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

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



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

tr. HF

Value / Analyte(s):

1 000 µg/mL ea:

Titanium

Starting Material:

Ti Metal

Starting Material Lot#:

2094

Starting Material Purity: 99.9975%

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Value:

 $1002 \pm 5 \mu g/mL$

Density:

1.012 g/mL (measured at 20 ± 4 °C)

Assay Information:

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

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

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

 \mathbf{X}_{i} = mean of Assay Method i with standard uncertainty u_{char} i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_n = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage) 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.

| | M | Ag | < | 0.000536 | М | Eu | < | 0.000268 | 0 | Na | < | 0.032670 | M | Se | | 0.001204 | 0 | Zn | < | 0.003267 |
|---|---|----|---|----------|---|------|---|----------|----|----|---|----------|---|----|---|----------|---|----|---|----------|
| | 0 | Αl | | 0.000872 | 0 | Fe | | 0.003225 | 0 | Nb | < | 0.043560 | 0 | Si | | 0.004735 | 0 | Zr | < | 0.043560 |
| | М | As | < | 0.008586 | M | Ga | < | 0.000268 | M | Nd | < | 0.000268 | M | Sm | < | 0.000268 | | | | |
| | М | Au | < | 0.004577 | M | Gd | < | 0.000268 | 0 | Ni | < | 0.010890 | M | Sn | | 0.000096 | | | | |
| | 0 | В | < | 0.008929 | M | Ge | < | 0.002146 | M | Os | < | 0.000269 | 0 | Sr | | 0.000096 | | | | |
| | М | Ba | < | 0.002683 | M | Hf | | 0.002161 | 0 | P | < | 0.054450 | M | Ta | | 0.010560 | | | | |
| | M | Ве | < | 0.005366 | М | Hg | < | 0.003231 | M | Pb | < | 0.001073 | M | Tb | < | 0.000268 | | | | |
| | M | Bi | < | 0.001609 | M | Но | < | 0.000268 | М | Pd | < | 0.000268 | M | Te | < | 0.001341 | | | | |
| | 0 | Ca | | 0.000676 | M | In | < | 0.002683 | M | Pr | < | 0.000268 | M | Th | < | 0.053663 | | | | |
| | M | Cd | < | 0.000268 | M | lr - | < | 0.000269 | M | Pt | < | 0.000536 | s | Ti | < | | | | | |
| | М | Ce | < | 0.000268 | M | K | | 0.001172 | M | Rb | < | 0.000268 | M | TI | < | 0.000268 | | | | |
| | М | Co | < | 0.004293 | М | Lа | < | 0.000268 | M | Re | < | 0.000268 | M | Tm | < | 0.000268 | | | | |
| | M | Cr | | 0.000752 | 0 | Li | < | 0.027225 | M | Rh | < | 0.000268 | M | U | < | 0.000268 | | | | |
| | М | Cs | < | 0.000268 | М | Lu | < | 0.000268 | M | Ru | < | 0.000269 | M | V | < | 0.019855 | | | | |
| - | 0 | Cu | < | 0.010890 | 0 | Mg | < | 0.005445 | i | S | < | | M | W | | 0.000473 | | | | |
| | М | Dy | < | 0.000268 | 0 | Mn | < | 0.003267 | M: | Sb | < | 0.006976 | M | Υ | < | 0.002146 | | | | |
| | М | Er | < | 0.000268 | M | Мо | | 0.000774 | 0 | Sc | < | 0.004900 | M | 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 17, 2022

11.0

- 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

2009784.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

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



Certified Reference Material CRM

M5962 R! 06/14/24



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

| m/z-> | | i, | m/z-> | | 10 c | ÷ is | 1. Selenium (Se) | Compound | | < | | Nominal Co | Re | | | CERTIFIED WEIGHT REPORT | מדודודה שובום |
|-------|-------|-------|---------|-------|---------|---------------------------------------|--------------------|--------------------------------------|--|---|---------------------|--------------------------------|----------------------|----------------|-----------------------------|-------------------------|---------------|
| 210 | 1.008 | 2.008 | 110 | 1.008 | /z-> 10 | [1] Spectrum No.1 | | | | Volume shown below was diluted to (mL): | NIST Test Number: | Nominal Concentration (µg/mL): | Recommended Storage: | 1 | Lot Number: Description: | Part Number: | 1 11000H |
| 0 | | | 0 | | Ū | Z | 58134 | Number | Part | as dilute | | | | | in in in | _ | |
| 220 | | | 120 | | N 0 | r. | 071223 | Number | Lot | d to (mL): | 6UTB | 1000 | Ambient (20 °C) | | 060624 Selenium (Se) | 57034 | |
| Ŋ | | | <u></u> | | ω | 3.702 | 0.1000 | Factor | Dilution | 2000.07 | | | <u>೦</u> | | Se) | | |
| 230 | | | 130 | | 90 | sec]:58 | 200.0 | Val. (mL | Initial | 0.100 | 5E-05 | | | | | | |
| 240 | | | 140 | | 40 | 33.702 sec]:58034.D# [Count] [Linear] | 0.084 | Vol. (mL) Pipette (mL) Conc. (µg/mL) | Uncertainty | Flask Uncertainty | Balance Uncertainty | | | | | | |
| 250 | | | 150 | | 50 | Count) [L | 1000 | Conc. (µg/mL) | Nominal | ťγ | ainty | | | 2.0% | 24007540 | 24002546 | |
| 260 | | | 160 | | . 60 | inear 2 | 10002.5 | Conc. (µg/mL | Initial | | | | (mL) | 40.0 | No. | Solvent: | |
| 0 | | | | | | | 1000.0 | Conc. (µg/mL) Conc. (µg/mL) | Final | | | | | Nitric Acid | | | (1) |
| | | | 170 | | 70 | | 2.2 | .) +/- (µg/mL) | Uncertainty | Expanded | Reviewed By: | K | N | Formulated By: | M | | 10 |
| | | | 180 | | 80 | | 7782-49-2 | C | (So | | y: | 200 | 11 | Ву: | | | |
| | | | 190 | | 90 | | 2 0.2 mg/m3 | OSHA PEL (TWA) | (Solvent Safety Info. On Attached pg.) | SDS Information | Pedro L. Rentas | leenes | | Benson Chan | M | | |
| | | | 200 | | 100 | | | NA) |). On Atta | rmation | ntas | , | / | 5 | | | |
| | | | - | | J | | orl-rat 6700 mg/kg | LDS0 | ched pg.) | | 060624 | | | 060624 | | | |
| | | | | | | | 3149 | SRM | NIST | | 4 | | | 4-1 | | _ | |

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

| | | | | | | | I race M | 1etals | Verifica | lion | oy ICP-M | S (1) | g/mL) | | | | | | |
|----|-------|-----|-------|-----|-------|----|----------|--------|----------|------|----------|-------|-------|----|-------|----|-------|----|-------|
| Al | <0.02 | CG | <0.02 | Dγ | <0.02 | HH | <0.02 | 11 | <0.02 | Z. | <0.02 | Pr | <0.02 | Se | H | 16 | 40.02 | W | 40,02 |
| SЪ | <0.02 | ದ್ದ | <0.2 | 퍜 | <0.02 | н | <0.02 | Į. | <0.02 | ₽ | <0.02 | Re | <0.02 | S: | <0.02 | Te | <0.02 | U | <0.02 |
| As | <0.2 | ಕಿ | <0.02 | 핃 | <0.02 | Ħ | <0.02 | Mg | <0.01 | ° | <0.02 | Rh | 40.02 | Ag | <0.02 | ∄ | 40.02 | ۷ | <0.02 |
| Ва | <0.02 | င္တ | <0.02 | æ | <0.02 | ŀ | <0.02 | Mn | <0.02 | Pd | 40.02 | ₽. | <0.02 | Na | <0.2 | Ħ | <0.02 | ታ | <0.02 |
| Ве | 40.01 | ť | 40.02 | Ga | <0.02 | F | <0.2 | Hg | A02 | P | <0.02 | Ru | 40.02 | Sr | <0.02 | Tm | <0.02 | ¥ | <0.02 |
| Bi | 40.02 | င္ပ | <0.02 | ଦ୍ଧ | <0.02 | Ľ | <0.02 | Mo | <0.02 | 7 | <0.02 | Sm | 40.02 | S | <0.02 | Sn | 40.02 | Zn | <0.02 |
| В | <0.02 | Cι | <0.02 | Au | <0.02 | Рь | <0.02 | M | <0.02 | × | 40.2 | Sc | <0.02 | Ta | <0.02 | Ħ | <0.02 | Z | <0.02 |

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

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

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

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

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

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

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

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

\$

Certified Reference Material CRM

20

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

Part # 57003 Lot # 062124

1 of 2

Printed: 6/24/2024, 11:20:08 PM

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



Certified Reference Material CRM



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

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

| 40.02 40.01 | 40.2 40.02 | 40.2 40.02 | 40.2 | | <0.02 | <0.02 | | | | |
|----------------|----------------|---------------|-------|-------|-------|-------|--------------|---|-----------|---|
| 8 ជ ជ | ა ზ | S | | င့ | Ca | Ω | | | | |
| <0.02 | | <0.02 | <0.02 | <0.02 | <0.2 | <0.02 | | | | |
| | ဝှ | Ga | Gd | Eu | 먁 | Ьy | | | | |
| 3 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 20.02 | | | | |
| Pb | ŗ | Fe | 뉵 | Ħ | Но | H | 1 | | | |
| 40.02 | <0.02 | <0.2 | <0.02 | <0.02 | <0.02 | 20.02 | | | Trace V | |
| NA | Мо | Hg | Mn | Mg | Lu | Ē | | | etals | |
| <0.02 | <0.02 | <0.2 | <0.02 | <0.01 | <0.02 | 1 | 3 | | Verifica: | |
| × | 7 | P | Pd | Ç | 8 | 1 2 | Z. | ľ | tion b | ١ |
| <0.2 | <0.02 | <0.02 | 40.02 | 20.02 | 20.02 | 0.02 | A | ľ | V CP-V | ١ |
| Sc | Sm | Ku | 8 | 1 5 | 1 6 | : | P | | ori) Si | ۱ |
| <0.02 | <0.02 | 20.02 | <0.02 | <0.02 | 50.02 | 5 6 | <0.02 | | <u></u> | ١ |
| Ta | | , H | N | 3v | 2 | 2 ! | Se | ۱ | | I |
| 20.02 | 20.02 | 20.02 | 100 | 40.02 | 0.00 | 3 | € 0.2 | | | |
| - | 1 1 | ? [| 1 : | 1 : | 3 5 | 7 | dE | | | I |
| 20.02 | 40.02 | 3 6.02 | 3 6 | 0.02 | 0.00 | 2 | <0.02 | | | |
| E | 7 1 | 7, | < ? | \$. | < 0 | = | W | | | |
| 20.02 | 40.02 | 200 | 3 8 | 3 8 | 000 | <0.02 | <0.02 | | | |

(T) = Target analyte

Physical Characterization:

Al Sh As Ba Ba Bi

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

Certified by:

| | Puri | 굺 |
|---|--|----------|
| | Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in | certifi |
| | ids, | ed v |
| • | 18.2 | alue i |
| = | 3 | st |
| | ego | he |
| | 풀 | con |
| | dei | cen |
| | Si. | tra |
| | zed | tio |
| | wa | 1 ca |
| | ter, | Cul |
| | ca | ate |
| | ğ | <u>d</u> |
| | ate | Om |
| | G | gra |
| | ass | MINE |
| | Þ | - EE |
| | gla | 2 |
| | WSS | ano |
| | are | V |
| | an | ŭ |
| | d | ec |
| | ne | 5 |
| | ngr | 100 |
| | lesi | ž |
| | þ | 9 |
| | ā | : 0 |
| | y ra | 8 |
| | × | d |
| | nac | 00 |
| | ens | . 0 |
| | S | 9 |
| | are | 00 |
| | USU | 000 |
| | ed | |
| | 3 | |
| | | |
| | | |

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

* Standards are prepared gravimetrically using balances that are calibrated.

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

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

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

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

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

Part # 57003 Lot # 062124

Printed: 6/24/2024, 11:20:08 PM

2 of 2



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M5984 R:6/14/24

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGY10

Lot Number:

V2-Y740548

Matrix:

2% (v/v) HNO3

Value / Analyte(s):

10 000 μg/mL ea:

Yttrium

Starting Material:

Yttrium Oxide

Starting Material Lot#:

2661 and 06230520YL

Starting Material Purity:

99.9984%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

10000 ± 30 µg/mL

Density:

1.032 g/mL (measured at 20 \pm 4 °C)

Assay Information:

Assay Method #1

10011 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #2

9997 ± 50 µg/mL

ICP Assay NIST SRM 3167a Lot Number: 190730

Assay Method #3

9984 ± 31 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRM/RM}, 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 uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

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.

Characterization of CRM/RM by One Method

is used is the mean of individual results:

X_a = mean of Assay Method A with

u_{bb} = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

XCRM/RM = (Xa) (uchar a)

k = coverage factor = 2

uchar a = the errors from characterization

uts = transport stability standard uncertainty

Certified Value, X_{CRM/RM}, where one method of characterization

ucher a = the standard uncertainty of characterization Method A

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

| M | Ag | < | 0.004600 | M | Eu | | 0.009037 | M | Na | | 0.086360 | M | Se | < | 0.005200 | M | Zn | | 0.030125 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| M | A! | | 0.014862 | 0 | Fe | | 0.002410 | М | Nb | < | 0.000570 | 0 | Si | | 0.024100 | 0 | Zr | < | 0.002600 |
| M | As | < | 0.003500 | М | Ga | < | 0.000570 | М | Nd | | 0.000923 | M | Sm | | 0.000461 | | | | |
| M | Au | < | 0.001700 | M | Gd | < | 0.003500 | М | Ni | < | 0.005700 | M | Sn | < | 0.002300 | | | | |
| 0 | В | | 0.002209 | M | Ge | < | 0.005200 | М | Os | < | 0.001200 | M | Sr | < | 0.004600 | | | | |
| 0 | Ba | < | 0.002500 | М | Hf | < | 0.000570 | n | Р | < | | M | Ta | < | 0.000570 | | | | |
| 0 | Ве | < | 0.001400 | M | Hg | < | 0.000570 | M | Pb | | 0.005020 | M | Τb | | 0.001044 | | | | |
| М | Bi | < | 0.003500 | M | Но | | 0.009037 | M | Pd | < | 0.005100 | М | Te | < | 0.002300 | | | | |
| 0 | Ca | | 0.009841 | M | In | < | 0.002300 | M | Pr | < | 0.002300 | М | Th | < | 0.000570 | | | | |
| M | Cd | < | 0.000570 | М | Ir | < | 0.000570 | M | Pt | < | 0.000570 | М | Ti | < | 0.003500 | | | | |
| M | Ce | < | 0.002300 | 0 | K | | 0.018677 | М | Rb | < | 0.000570 | М | TI | < | 0.000570 | | | | |
| М | Co | < | 0.000570 | М | La | | 0.000461 | М | Re | < | 0.000570 | М | Tm | < | 0.003500 | | | | |
| М | Cr | < | 0.004000 | 0 | Li | < | 0.009300 | M | Rh | < | 0.008000 | М | U | < | 0.000570 | | | | |
| M | Cs | < | 0.000570 | М | Lu | | 0.000582 | M | Ru | < | 0.000570 | М | ٧ | | 0.001265 | | | | |
| М | Cu | | 0.002610 | 0 | Mg | | 0.001486 | n | S | < | | М | W | < | 0.002300 | | | | |
| М | Dy | | 0.003815 | М | Mn | | 0.000582 | М | Sb | | 0.005422 | s | Υ | < | | | | | |
| М | Er | | 0.003615 | М | Мо | < | 0.005700 | М | Sc | < | 0.001200 | М | Yb | | 0.001827 | | | | |

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

6.0 **INTENDED USE**

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

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures 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 $20^{\circ} \pm 4^{\circ}$ 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 - 88.91 +3 6 Y(OH)(H2O)x+2 Chemical Compatibility -Soluble in HCl, H2SO4 and HNO3. Avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.

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

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

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in

H2O/ HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCl or HNO3).

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General 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: 540.565.3012; inorganicventures.com;

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

11.1 Certification Issue Date

February 20, 2024

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

| - Sealed TCT Bag 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** Mayor May

Certificate Approved By:

Muzzammii Khan Stock Laboratory Supervisor

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M5985 R:6/14/24

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGIN10

Lot Number:

U2-IN729349

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

10 000 μg/mL ea:

Indium

Starting Material:

Indium Metal

Starting Material Lot#:

2511

Starting Material Purity:

99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

 $10022 \pm 30 \mu g/mL$

Density:

1.044 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

10021 ± 56 µg/mL

ICP Assay NIST SRM 3124a Lot Number: 110516

Assay Method #2

10035 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

10001 ± 33 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRM/RM}, 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 uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

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

Characterization of CRM/RM by One Method

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

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u_{char a} = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

n - Not Checked For s - Solution Standard Element

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

i - Spectral Interference

INTENDED USE 6.0

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

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 21, 2023

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

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

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

20178hi



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com R: 2/22/24 M5996

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CLPP-CAL-1

Lot Number:

T2-MEB714417

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

5 000 μg/mL ea:

Calcium,

Potassium,

Magnesium,

Sodium,

2 000 µg/mL ea:

Aluminum,

Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Nickel,

Vanadium,

Zinc,

Cobalt,

Manganese,

250 µg/mL ea:

Silver,

Copper,

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density: 1.118 g/mL (measured at 20 ± 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

Xi = mean of Assay Method i with standard uncertainty uchar 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 (±) = $U_{CRM/RM} = k \left(u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2\right)^{1/2}$

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

XCRM/RM = (Xn) (uchar n)

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

8.0 HAZARDOUS INFORMATION

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

January 27, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

- 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 DD9784.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com R:2/22/24 M5-997

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CLPP-CAL-3

Lot Number: T2-MEB727800

Matrix: 7% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea: Arsenic,

Arsenic, Lead, Selenium, Thallium,

500 µg/mL ea: Cadmium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE | CERTIFIED VALUE 1 000 ± 7 μg/mL | ANALYTE | CERTIFIED VALUE |
|-------------|---------------------------------|--------------|-------------------|
| Arsenic, As | | Cadmium. Cd | 500.0 ± 2.2 µg/mL |
| Lead, Pb | 1 000 ± 4 µg/mL | Selenium, Se | 1 000 ± 6 μg/mL |

Thallium, Ti 1 000 \pm 7 μ g/mL

Density: 1.042 g/mL (measured at 20 ± 4 °C)

Assay Information:

| ANALYTE | METHOD | NIST SRM# | SRM LOT# |
|---------|------------|-----------|--------------|
| As | ICP Assay | 3103a | 100818 |
| As | Calculated | | See Sec. 4.2 |
| Cd | ICP Assay | 3108 | 130116 |
| Cd | EDTA | 928 | 928 |
| Pb | ICP Assay | 3128 | 101026 |
| Pb | EDTA | 928 | 928 |
| Se | ICP Assay | 3149 | 100901 |
| TI | ICP Assay | 3158 | 151215 |

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

XCRM/RM = (Xa) (uchar a)

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 21, 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

- December 21, 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 DD9784.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



300 Technology Drive Christiansburg, VA 24073 USA

inorganicventures.com

Certificate of Analysis

M6074

M6075 M6076 M6077

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

EXP. 9/6/2029

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CHEM-CLP-4

Lot Number:

V2-MEB746762

Matrix:

3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s):

1 000 µg/mL ea:

Boron,

Molybdenum,

Silicon,

Tin,

Titanium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Boron, B **CERTIFIED VALUE**

ANALYTE Molybdenum, Mo **CERTIFIED VALUE**

1 000 ± 5 μg/mL

Silicon, Si

1 000 ± 5 µg/mL

Tin, Sn

1 000 ± 5 µg/mL

Titanium, Ti

1 000 ± 7 μg/mL

1 000 I 5 pg/mL

1 000 ± 6 µg/mL

Density:

1.033 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, X_{CRW/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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

INTENDED USE 6.0

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 06, 2024

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

11.2 Lot Expiration Date

- September 06, 2029
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

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

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

Paul R Sains

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Joseph Burns Custom VS Manager

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certified Reference Material CRM



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

| m/z-> | 1.0 m 4 | 1000 | m/z-> 2000 | 6.0E6 | 1.0E8 | Compound RM# Number 1. Magnesium nitrate hexahydrate (Mg) IN030 маровгогаал | Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa | Expiration Date: | Par Lo |
|---------|------------|---------------|---------------|-------|-------------------------|--|--|----------------------------------|---|
| N 10 | | | ō | | [1] Spectrum No.1 | nydrate (Mg) | NIST Test Number: 6UTB Weight shown below was diluted to (mL): | Expiration Date: nended Storage: | Part Number: Lot Number: Description: |
| | | | | | 3 Z 0 | RIM# Nu NO30 MGD0 | 10000 6UTB diluted to (mi | 112 Ami | 112 Ma |
| | Ñ | · - - | 20 | | | - 11 | | 112127 Ambient (20 °C) | 58112 112124 Magnesium |
| ļ. | 130 | | 30 | | 9.923 | Nominal Conc. (µg/mL) 10000 | 2000.07 | 0 | IPM TO |
| | | | | | ec];581 | (%) (%) Purity (| 5E-05 B | 9 | 5 |
| | 4 | | A • | | * | Uncertainty Purity (%) 0.10 | 5E-05 Balance Uncertainty 0.100 Flask Uncertainty | | 10 x 1/13/250 Nont: |
| | | | 70 | | Count | Assay (%) v | ainty ity | 2% | vent: 2 |
| | 150 | | 50 | | | Target Weight (g) 234.9183 | | 40.0 (mL) | 24012496 |
| | 100 | | G . | | .j [6 | Actual Weight (g) | | Nitric Acid | Nitric Acid |
| | 170 | | 70 | | - 11 | Actual Conc. (µg/mL) | | | bid. |
| | | | | | No. | Uncertainty +/- (µg/mL) | Reviewed By: | Formulated By: | 32 |
| | 80 | | 8 . | | 10-8 | CAS | By: | M By | iovanni |
| | 190 | | 0 | | 3 | vent | Pedro L. Rentas SDS Inform | | e Esta |
| | NO 0 | | 1 0. | | on-rai | o. On Attachec | ro L. Remas SDS Information | osito | ato a |
| | | | | | on-rat 5440 mg/kg 3131a | рд.) 1050 | 112124 | 112124 | |

Part # 58112

1 of 2

www.absolutestandards.com

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

| В | Ď | 7 | E C | Ва | Às | Sb | Αl | | | |
|-------|----------------|--------------|-------|-------|-------|-------|---------------|---|----------|-----|
| <0.02 | 20.05 | 3 | 0.01 | <0.02 | 402 | <0.02 | <0.02 | | | |
| Cu | 5 | 3 | 유 | స | ဂ္ဂ | C2 | Cd | | | |
| <0.02 | 70.02 | 3 | 40.02 | <0.02 | 40.02 | 0.2 | <0.02 | | | |
| Au | ç | 9 | ලු | 足 | 멸 | 탁 | Dy | | | |
| <0.02 | 10.01 | 3 | <0.02 | <0.02 | 40.02 | <0.02 | <0.02 | | | |
| Pb | į | - | 77 | Ϊ́ | In | Но | Hf | | ١. | l |
| <0.02 | 10:01 | 3 | 40.2 | <0.02 | <0.02 | <0.02 | 40.02 | | Trace Mo | |
| Nd | | 5 | Hg | Mn | Mg | Ē | Ε. | | etals | |
| <0.02 | 0 00 | 400 | 40.2 | <0.02 | Н | <0.02 | <0.02 | | Verifica | |
| 7 | ; ; | ¥ | Ъ | Pd | ô | B | Z | ı | tion | |
| 70 | 3 | A).02 | <0.02 | <0.02 | 40.02 | <0.02 | △ 0.02 | | oy ICP-N | |
| oc. | 2 | Sm | Ru | Rb | Rh | Ke | , <u>z</u> | | 15 (1) | , |
| 70.05 | 3 | ∆ .02 | <0.02 | <0.02 | 40.02 | 20.02 | 0.02 | | g/mL) | , , |
| 165 | ,] | (A) | Sr | N | Ag | . S | 8 | , | | |
| 20.02 | 3 | <0.02 | <0.02 | 40.2 | 20.02 | 20.02 | 9 6 | | | |
| Ŀ | :1 | Sh | Tm | 15 | 1 = | 1 5 | 7 10 | | l | |
| 10:02 | 3 | 40.02 | 40.02 | 20.02 | 20.02 | 50.02 | 20.02 | 3 | | |
| | 7, | Zn | × | 10 | \$ < | 4 0 | ≒ ≉ | W | | |
| 10.00 | 200 | <0.02 | 40.02 | 20.02 | 0.02 | 200 | 3 6 | 3 | | |

(I) = larget analyte

Physical Characterization:

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

Certified by:

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

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

Part # 58112

2 of 2

www.absolutestandards.com

Part Number:

Lot Number:



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

CERTIFIED WEIGHT REPORT:

Formulated By: Diovannie Giovanni Esposito 2 Septe 101124

Pedro L. Rentas

101124

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

Manganese (Mn)

Ambient (20 °°)

Manganese (20 °°) 1000

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

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/ml.)

+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM NIST T SDS Information

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

| m/z-> | 5.0E7 | 1.0E8 | 5.0E7 | 1.0E8 | 7-2/2 | N UI | 5. OE6 |
|-------------|-------|--------|-------|-------|----------|---------|---|
| | | | | | | | [1] 88 |
| 0 | | 110 | | | 0 | | [1] Spectrum No.1 |
| | | | • | | | | NO.1 |
| N N O | | 120 | | | 0 | | و |
| 230 | | 100 | | | 30 | | 1.243 |
| ō | | Ō | | | | | ec]:57(|
| N 40 | | 140 | | | 40 | | [34.243 sec]:57025.D# [Count] [Linear] |
| | | | | | | | Coun |
| N D | | 150 | | | 6 | | tj (Line |
| N O | | 300 | | | 0 | | 2 |
| J | | J | | | | | |
| | | 170 | | | 70 | | |
| | | - | | | Ó | | |
| | | 0 | | | 80 | | |
| | | 90 | | | 0 | | |
| | | | | | | | |
| | | N 0 | on. | | 100 | | |



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

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

| Г | | | | | | | Trace Me | etals | Verifica | tion | by ICP- | SM | (µg/mL) | | | | | | |
|----|---------------|-----|---------------|-----|-------|----|----------|-------|----------|------|---------|----------|--------------|-----------------|-------------|----|-------|----|------------------|
| 2 | ∆ 0.02 | 8 | 40.02 | Dγ | 40.02 | H | <0.02 | | <0.02 | Z | <0.02 | P | <0.02 | Se | 40.2 | 41 | <0.02 | × | A0.02 |
| dS | <0.02 | ರೌ | 40.2 | 뎍 | <0.02 | Н | <0.02 | Ę | 40.02 | Z | 40.02 | Re | <0.02 | ž. | 40.02 | Te | <0.02 | c | 40.02 |
| As | <0.2 | င္ပ | <0.02 | 핃 | <0.02 | In | <0.02 | Mg | 40.01 | 0° | <0.02 | 굦 | <0.02 | A | 8,02 | 1 | <0.02 | < | <0.02 |
| Ba | 40.02 | ဂ္ဂ | 40.02 | හි | <0.02 | Ħ | 40.02 | Mn | H | 꾿 | 40.02 | 공 | 40.02 | Z. | 40,2 | 금 | <0.02 | ⋨ | ♦0.02 |
| Ве | 40.01 | 턴 | 40.02 | ନ୍ଥ | 40.02 | 7. | 40.2 | He | 40.2 | P | 40.02 | R | 40.02 | Sr | A).02 | Tm | <0.02 | × | < 0.02 |
| Bi | 0.02 | ဝ | ∆ 0.02 | ନ୍ମ | 40.02 | La | <0.02 | Mo | 40.02 | 7 | 40.02 | Sm | <0.02 | S | A.02 | Sn | <0.02 | Zn | \$0.02 |
| В | <0.02 | Cu | <0.02 | Au | <0.02 | РЬ | <0.02 | Nd | <0.02 | * | <0.2 | Sc | <0.02 | T ₂₂ | 40.02 | 크 | <0.02 | Zr | <0.02 |
| | | | | | | | | | } | | | | | | | | | | |

(T) = Target analyte

Physical Characterization:

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

Certified by:

Jon 7 Mills

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



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M6137

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGSI1

Lot Number:

V2-SI744713

Matrix:

tr. HNO3

tr. HF

Value / Analyte(s):

1 000 µg/mL ea:

Silicon

Starting Material:

Silica

Starting Material Lot#:

1771

Starting Material Purity:

99.9981%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

999 ± 6 µg/mL

Density:

1.003 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

999 ± 5 µg/mL

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

Assay Method #2

1000 ± 7 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

k = coverage factor = 2

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

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X, = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 **INTENDED USE**

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

Atomic Welght; Valence; Coordination Number; Chemical Form in Solution - 28.09 +4 6 Si(OH)x(F)y2-Chemical Compatibility -Soluble in HCl, HF, H3PO4 H2SO4 and HNO3 as the Si(OH)x(F)y2-. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths, or high levels of transition elements unless they are fluorinated. Stable with most inorganic anions with a tendency to hydrolyze forming silicic acid (silicic acid is soluble up to ∼100 ppm in water) in all dilute acids

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

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

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

| | • | | |
|--------------------|-------------------|-------|---|
| Technique/Line | Estimated D.L. | Order | Interferences (underlined indicates severe) |
| ICP-MS 28 amu | 4000 - 8000 ppt | N/A | N2, 12C16O |
| ICP-OES 212.412 nm | 0.02/0.01 µg/mL | 1 | Hf, Os, Mo, Ta |
| ICP-OES 251.611 nm | 0.012/0.003 µg/mL | 1 | Ta, U, Zn, Th |
| ICP-OES 288.158 nm | 0.03/0.004 µg/mL | 1 | Ta, Ce, Cr, Cd, Th |

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

QUALITY STANDARD DOCUMENTATION 10.0

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0 Certificate Prepared By:

Uyen Truong Custom Processing Supervisor

Mayyand Man
Paul R. Laine

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: 1. Potassium nitrate (K) Nominal Concentration (µg/ml.): アンメート m/z-> Weight shown below was diluted to (mL): Recommended Storage: 1.0≡4 1.0E5 2.0 € 5 1.0⊑8 2.0E6 5000 **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 0 IN034 KD062022A1 BTU9 57119 103024 Potassium (K) M6141 10000 103027 Ambient (20 °C) Number 5 120 NO [35.763 sec]:58119.D# [Count] [Linear] Conc. (µg/mL) 4000.1 10000 76142 Nominal R->1/13/25 130 90 99.999 0.15 Flask Uncertainty 5E-05 Balance Uncertainty Purity 8 Uncertainty Assay Purity (%) 0.10 40 40 Solvent: 24002546 37.7 æ 2% 150 106.1040 0 Weight (g) Target 80.0 Lot # Nitric Acid Nitric Acid ###### Weight (g) Conc. (µg/mL) Actual 160 00 10001.1 Actual 170 0 Reviewed By: Formulated By: +/- (µg/mL) Uncertainty Expanded 20.0 Dievanne 180 80 7757-79-1 CAS# (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Giovanni Esposito からからかん OSHA PEL (TWA) 190 90 **SDS Information** 5 mg/m3 100 200 orl-rat 3750 mg/kg 3141a LD50 103024 103024 SRM NIST

m/z->

210

220

230

240

250

200

Printed: 1/10/2025, 4:48:21 PM



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

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

| 1 | L | H | ы | क | 7 | S | , | | | 1 |
|---------------------|-------|-------|--------------|----------------|-------|--------------|-------|---|---------------|---|
| | 8 | 3. | 6 | 2 | As | - | | 1 | | I |
| | 40.02 | 40.02 | <0.01 | 40.02 | 0.2 | 40.02 | 40.02 | | | |
| | Cu | ဝ | Ω | Ç | င္ပ | က္ဆ | S | 1 | | |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 402 | <0.02 | | | |
| | Au | ନ | යු | ନୁ | 댐 | 田 | Ņ | I | | |
| | <0.02 | 40.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | | |
| | 29 | L | Fe | Ϊ́ | ħ | Но | Hf | İ | | |
| | <0.02 | <0.02 | 402 | <0.02 | <0.02 | <0.02 | <0.02 | | Trace M | |
| | N | Mo | Hg | Mn | Mg | L | Ε. | i | Metals | |
| (T) - Tamet analyte | <0.02 | <0.02 | 40.2 | <0.02 | <0.01 | <0.02 | <0.02 | | Verifica | |
| ne ten | × | 7 | P | Pd | õ | 7 | Z | ı | tion | |
| alvio | Ţ | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | by ICP- | |
| | Sc | Sm | Ru | Rb | 字 | Re | 꾸 | ı | MS (| |
| | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | (µg/mL) | |
| | Ta | S | Sr | N _B | Ag | Si | Se | I | | I |
| | <0.02 | <0.02 | <0.02 | 40.2 | <0.02 | <0.02 | <0.2 | | | |
| | Ti | Sn | Im | H | 1 | Te | Тb | l | | |
| | <0.02 | 40.02 | △0.02 | €0.02 | ₫.02 | 40.02 | <0.02 | | | |
| | Zr | Zn | ¥ | 4 | < | c | W | I | | |
| | 40.02 | 0.02 | 40.02 | <0.02 | <0.02 | 40.02 | <0.02 | | | |

(i) = larger analyre

Physical Characterization:

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

Certified by:

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

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

Part # 57119

www.absolutestandards.com



Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: 1. Sodium nitrate (Na) Neminal Concentration (µg/mL): Recommended Storage: Weight shown below was diluted to (mL): m/z-> m/z-> H/X-Y NIST Test Number: 2.5E6 5.0E6 2.500 5.0E6 2.5E5 5.0E5 **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 210 110 IN036 NAV01201511 0 RM# **6UTB** 072427 58111 072424 10000 Ambient (20 °C) Sodium (Na) Number Lot 120 220 NO [8.935 sec]:58111.D# [Count] [Linear] Conc. (µg/mL) 10000 4000.2 Nominal M6144 R->1/13/2 Solvent: 130 30 99.999 5E-05 Balance Uncertainty Purity 0.10 Flask Uncertainty (96) Uncertainty Assay Purity (%) 0.10 240 140 4 26.9 8 2% 24002546 Nitric Acid 148.7096 Weight (g) Target (mL) 250 150 50 ###### Weight (g) Conc. (µg/mL) Nitric Acid Actual 160 260 0 10000.0 Actual 170 70 +/- (µg/mL) Uncertainty Reviewed By: Formulated By: Expanded 20.0 7631-99-4 180 80 CAS# (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Benson Chan OSHA PEL (TWA) **SDS** Information 180 90 5 mg/m3 200 100 orl-rat 3430 mg/kg 3152a 072424 072424 TSIN MES.

Printed: 1/10/2025, 4:48:22 PM

1 of 2

www.absolutestandards.com



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

| В | <u>00</u> | Be | Ba | As | Sb | ≥ | | | |
|-------|-----------|-------|----------|-------|----------------|-------|-----------------|----------|---|
| <0.02 | <0.02 | <0.01 | <0.02 | 40.2 | <0.02 | <0.02 | | | |
| 5 | င္ပ | Ω | င္တ | දි | C ₂ | S | | | |
| <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 602 | <0.02 | | | |
| Au | င္ပ | ଦ୍ଧ | <u>ਨ</u> | Eu | ম্র | Ų | | | |
| <0.02 | <0.02 | <0.02 | △0.02 | <0.02 | 40.02 | 40.02 | STATE OF STREET | | |
| Pb | L | Fe | F | In | Но | Нf | | | |
| <0.02 | <0.02 | 40.2 | <0.02 | <0.02 | <0.02 | <0.02 | | Trace M | |
| Z | Mo | Hg | Mn | Mg | L | Ш | | etals | |
| 40.02 | △0.02 | 40.2 | <0.02 | <0.01 | <0.02 | 40,02 | | Verifica | |
| × | 7 | ۵ | Pd | 0° | 3 | Z. | | tion | |
| 40.2 | 40.02 | 0.02 | A.02 | 40,02 | 40.02 | <0.02 | | by ICP-N | |
| Se | Sm | Ru | Rb | Rh | Re | P | | S (III | |
| <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | a/mL) | |
| Ta | S | Sr | Z | Ag | S: | & | | | |
| 40,02 | 40.02 | 40,02 | -7 | <0.02 | <0.02 | <0.2 | | | |
| | Sn | Tm | H | ⊒ | Te | 4 | i | | I |
| 40,02 | 40.02 | <0.02 | <0.02 | <0.02 | △0.02 | <0.02 | | | |
| 127 | Zn | Y | 47 | < | C | W | | | |
| 20.02 | 40.02 | 40.02 | <0.02 | <0.02 | <0.02 | <0.02 | III O O O O | | |

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

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

All standard containers are meticulously cleaned prior to use.

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

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

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

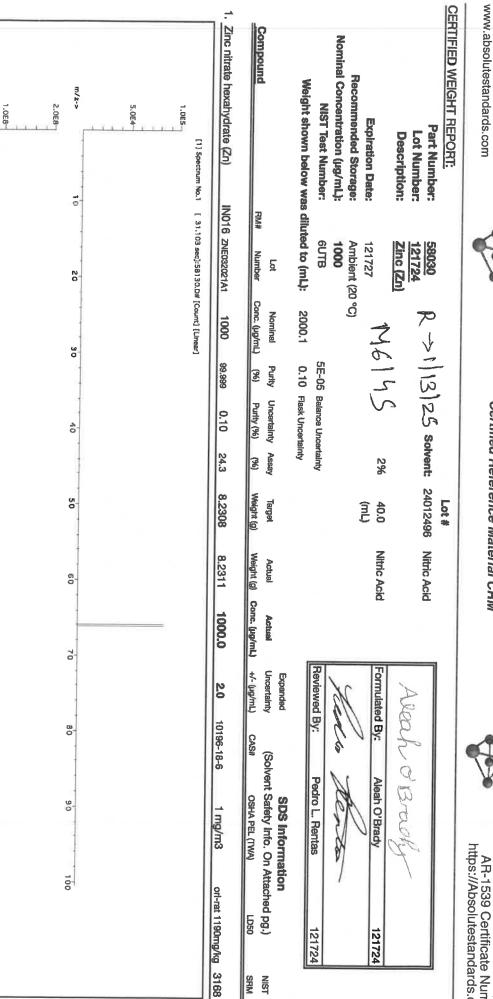
Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58111

Certified Reference Material CRM



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



NIST SRM

m/z->

210

220

230

240

250

260

m/z->

110

120

130

140

50

160

170

180

190

200

1.0E8

5.0E7



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

| | | | 20.02 | ra | 20.02 | 30 | 702 | 7 | 40.02 | Z | <0.02 | P | № 0.02 | Au | 40.02 | 5 | 40.02 | 00 |
|-----|-----|----|-----------|-----|--------------|-------------|----------|----------|----------|----------|---------|------|---------------|----|-------|-----|-------|----------|
| 7, | | 1 | 3 | 7 | 3 | 2 | | : : | 0 60 | 240 | 10.04 | La | 70.02 | CC | 20.02 | S | 20.02 | <u>5</u> |
| 107 | | Sn | 20:02 | v. | <u>A</u> .02 | Sm | 8 | ¥ | A 23 | 5 | 3 | 3 | 3 | 2 | 3 | 3 | 5 | 1 |
| 7, | | 2 | | > | | 1 | 40.00 | - | 10.6 | 27.7 | 10.4 | 70 | 20.02 | Ca | 20.02 | Z. | 10.0 | Be |
| ped | | B | 20.02 | S | A) (72 | Z :: | 3 | 0 | 3 | 5 | 5 | 5 | 3 | > | | 2 | | |
| 9 6 | 000 | 1 | , é | TVG | 20.02 | NO | 20.02 | Pa | 20.02 | Mn | <0.02 | H | 40.02 | 2 | 0.02 | င္တ | 40.02 | Ba |
| ¥ | | 1 | 3 | 2 | 3 | Į r | 8 | 1 | | 0 | 10.02 | 11.1 | 10.04 | ţ | 20.02 | ç | 7.03 | AS |
| _ | | | 20.02 | Ag | 40.02 | 25 | A .02 | ွ | A) () | × × | 3 | 3 | 3 | Į. | 3 | 3 | 3 | - |
| < | | 3 | 23 | | 0.00 | 1 | 40.00 | 540 | 10.04 | F | 20.02 | HO | 20.02 | Ħ | 4.0 | Ca | <0.02 | S |
| | | Te | ٥.03 - | S | A (2) | 200 | 3 | <u> </u> | 3 | <u> </u> | 3 | 5 | 5 | 1 | | 1 | 200 | 1 |
| : : | | | 104 | 26 | 20.02 | 7 | 70.02 | 2 | 20.02 | <u> </u> | <0.02 | Ħ | <0.02 | Dy | 0.02 | 2 | 40.02 | Δ] |
| 8 | |) | 200 | 62 | 2000 | | 5 | | | | | | | | | | | |
| | | | | | | | | | | | | ı | | I | ۱ | | | I |
| | | | | | | | | | | 0.000 | 1100011 | | | | | | | |
| | | | | | 0 | S U C | DV C | | Verifica | S IN I | Trace V | | | | | | | |
| | | | | | 1 | | | | | | | | | | | | | |

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

Part # 58030

Hydrochloric Acid, 36.5-38.0%

BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis





M6151

R-> 1/15/25

Material No.: 9530-33

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

Retest Date: 2027-06-14

Revision No.: 0

Certificate of Analysis

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

>>> Continued on page 2 >>>

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





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

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

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





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

Test

Specification

Result

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

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







R-02/02/2025

M-6158

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

Manufactured Date: 2024-03-26

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

Certificate of Analysis

| Test | Specification | Result |
|---|---------------|-------------|
| Assay (HNO3) | 69.0 - 70.0 % | |
| Appearance | Passes Test | 69.7 % |
| Color (APHA) | ≤ 10 | Passes Test |
| Residue after Ignition | | 5 |
| Chloride (CI) | ≤ 2 ppm | 1 ppm |
| Phosphate (PO ₄) | ≤ 0.08 ppm | < 0.03 ppm |
| Sulfate (SO ₄) | ≤ 0.10 ppm | < 0.03 ppm |
| Trace Impurities - Aluminum (AI) | ≤ 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 |
| Trace Impurities - Copper (Cu) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Gallium (Ga) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Germanium (Ge) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Gold (Au) | ≤ 20 ppb | < 10 ppb |
| Heavy Metals (as Pb) | ≤ 20 ppb | < 5 ppb |
| Trace Impurities - Iron (Fe) | ≤ 100 ppb | 100 ppb |
| Trace Impurities - Lead (Pb) | ≤ 40.0 ppb | < 1.0 ppb |
| Trace Impurities – Lead (PD) Trace Impurities – Lithium (Li) | ≤ 20.0 ppb | < 10.0 ppb |
| | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Magnesium (Mg) | ≤ 20 ppb | < 1 ppb |
| Trace Impurities - Manganese (Mn) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Nickel (Ni) | ≤ 20.0 ppb | < 5.0 ppb |
| | | |

>>> Continued on page 2 >>>





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

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

Nitric Acid 69% **CMOS**





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

Test Specification Result

For Microelectronic Use

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

Jamie Croak Director Quality Operations, Bioscience Production





M-6162

R. Date & 0412712025

Material No.: 9606-03 Batch No.: 24H0162012 Manufactured Date: 2024-06-28

Retest Date: 2029-06-27 Revision No.: 0

Certificate of Analysis

| Assay (HNOs) Appearance Passes Test Passes Test Passes Test Color (APHA) Residue after Ignition S 2 ppm Chloride (Cl) Choride (Cl) Choride (SOa) Sulfate (SOa) Sulfate (SOa) Arsenic and Antimony (as As) Trace Impurities - Barlum (Ba) Trace Impurities - Barlum (Ba) Trace Impurities - Barlum (Cd) Trace Impurities - Barlum (Cd) Trace Impurities - Coper (Cu) Trace Impurities - Coper (Cu) Trace Impurities - Coper (Cu) Trace Impurities - Cold (Au) Frace Impurities - Gold (Au) Frace Impurities - Iron (Fe) Trace Impurities - Iron (Fe) Trace Impurities - Inon (Fe) Trace Impurities - Lind magnesium (Mg) Trace Impurities - Lind (Fe) Trace Impurities - Lind (Fe) Trace Impurities - Lind (Fe) Trace Impurities - Coppe (Cu) Tra | Test | Specification | Result |
|---|-----------------------------------|---------------|---|
| Appearance Color (APHA) | Assay (HNO3) | 69.0 - 70.0 % | 69.7 % |
| Color (APHA) ≤ 10 5 Residue after Ignition ≤ 2 ppm < 1 ppm | Appearance | | |
| Residue after Ignition ≤ 2 ppm < 1 ppm | Color (APHA) | ≤ 10 | |
| Chloride (CI) ≤ 0.08 ppm 0.03 ppm Phosphate (PO4) ≤ 0.10 ppm < 0.03 ppm | Residue after Ignition | ≤ 2 ppm | |
| Phosphate (PO₄) ≤ 0.10 ppm < 0.03 ppm | Chloride (CI) | ≤ 0.08 ppm | |
| Sulfate (SO ₄) ≤ 0.2 ppm < 0.2 ppm | Phosphate (PO ₄) | ≤ 0.10 ppm | • • |
| Trace Impurities - Aluminum (Al) ≤ 40.0 ppb < 1.0 ppb | Sulfate (SO ₄) | ≤ 0.2 ppm | |
| Arsenic and Antimony (as As) \$\leq\$ 5.0 ppb | Trace Impurities - Aluminum (Al) | ≤ 40.0 ppb | • • |
| Trace Impurities – Barium (Ba) | Arsenic and Antimony (as As) | ≤ 5.0 ppb | |
| Trace Impurities – Beryllium (Be) Trace Impurities – Bismuth (Bi) Trace Impurities – Boron (B) Trace Impurities – Cadmium (Cd) Trace Impurities – Calcium (Ca) Trace Impurities – Calcium (Ca) Trace Impurities – Chromium (Cr) Trace Impurities – Cobalt (Co) Trace Impurities – Cobalt (Co) Trace Impurities – Copper (Cu) Trace Impurities – Copper (Cu) Trace Impurities – Callium (Ga) Trace Impurities – Gallium (Ga) Trace Impurities – Gallium (Ga) Trace Impurities – Germanium (Ge) Trace Impurities – Gold (Au) Heavy Metals (as Pb) Trace Impurities – Iron (Fe) Trace Impurities – Lead (Pb) Trace Impurities – Lead (Pb) Trace Impurities – Magnesium (Mg) Trace Impurities – Manganese (Mn) Trace Impurities – Mickel (Ni) ■ 20 ppb ■ 21.0 ppb ▼ 1.0 ppb | Trace Impurities - Barium (Ba) | ≤ 10.0 ppb | |
| Trace Impurities – Bismuth (Bi) \$\leq 20.0 ppb | Trace Impurities - Beryllium (Be) | ≤ 10.0 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 | Trace Impurities - Bismuth (Bi) | ≤ 20.0 ppb | • • |
| Trace Impurities - Cadmium (Cd) ≤ 50 ppb 0.3 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 - Magnesee (Mn) ≤ 10.0 ppb < 1.0 ppb | Trace Impurities - Boron (B) | ≤ 10.0 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 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 - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb | Trace Impurities - Cadmium (Cd) | ≤ 50 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 - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb | Trace Impurities - Calcium (Ca) | | • • |
| 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 - Magnesee (Mn) ≤ 10.0 ppb < 1.0 ppb | Trace Impurities - Chromium (Cr) | ≤ 30.0 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 - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb | Trace Impurities - Cobalt (Co) | ≤ 10.0 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 – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Manganese (Mn) ≤ 10.0 ppb | Trace Impurities - Copper (Cu) | ≤ 10.0 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 - Gallium (Ga) | ≤ 10.0 ppb | |
| Trace Impurities - Gold (Au) ≤ 20 ppb < 1 ppb | Trace Impurities - Germanium (Ge) | ≤ 20 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 - Gold (Au) | ≤ 20 ppb | • • |
| Trace Impurities – Iron (Fe) ≤ 40.0 ppb < 1.0 ppb | Heavy Metals (as Pb) | ≤ 100 ppb | |
| Trace Impurities – Lead (Pb) ≤ 20.0 ppb < 1.0 ppb | Trace Impurities - Iron (Fe) | ≤ 40.0 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 - Lead (Pb) | ≤ 20.0 ppb | • |
| Trace Impurities – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb Trace Impurities – Mickel (Ni) | Trace Impurities - Lithium (Li) | ≤ 10.0 ppb | . , |
| Trace Impurities - Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb | Trace Impurities – Magnesium (Mg) | ≤ 20 ppb | • • |
| Trace Impurities Mickel (Ni) | Trace Impurities - Manganese (Mn) | ≤ 10.0 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 | < i 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/ml | 5 par/ml |
| | | |

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

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: QCP-CICV-1

Lot Number: V2-MEB744107

Matrix: 7% (v/v) HNO3

Value / Analyte(s): 2 500 μg/mL ea:

Calcium, Potassium,
Magnesium, Sodium,

1 000 µg/mL ea:

Aluminum, Barium,

500 μg/mL ea:

Iron,

250 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese,

125 μg/mL ea:

Silver, Copper,

100 μg/mL ea: Chromium, 25 μg/mL ea: Beryllium

Second Source: Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE Aluminum, Al | CERTIFIED VALUE 1 000 ± 4 µg/mL | ANALYTE Barium, Ba | CERTIFIED VALUE 1 000 ± 6 μg/mL |
|-------------------------|------------------------------------|-----------------------|------------------------------------|
| Beryllium, Be | 24.98 ± 0.12 μg/mL | Calcium, Ca | 2 500 ± 8 μg/mL |
| Chromium, Cr | 99.9 ± 0.6 μg/mL | Cobalt, Co | 250.2 ± 1.2 μg/mL |
| Copper, Cu | 125.0 ± 0.5 μg/mL | Iron, Fe | 500.0 ± 2.2 μg/mL |
| Magnesium, Mg | 2 500 ± 11 μg/mL | Manganese, Mn | 249.9 ± 1.1 μg/mL |
| Nickel, Ni | 250.0 ± 1.2 μg/mL | Potassium, K | 2 500 ± 11 μg/mL |
| Silver, Ag | 125.0 ± 0.6 μg/mL | Sodium, Na | 2 500 ± 11 μg/mL |
| Vanadium, V | 250.0 ± 1.1 μg/mL | Zinc, Zn | 249.9 ± 1.1 μg/mL |

Density: 1.081 g/mL (measured at 20 \pm 4 °C)

Assay Information:

| 133 | ay iiiioiiiiatioii. | | | |
|-----|---------------------|-------------|-----------|--------------|
| | ANALYTE | METHOD | NIST SRM# | SRM LOT# |
| | Ag | ICP Assay | 3151 | 160729 |
| | Ag | Volhard | 999c | 999c |
| | Al | ICP Assay | 3101a | 140903 |
| | Al | EDTA | 928 | 928 |
| | Ва | ICP Assay | 3104a | 140909 |
| | Ва | Gravimetric | | See Sec. 4.2 |
| | Be | ICP Assay | 3105a | 090514 |
| | Be | Calculated | | See Sec. 4.2 |
| | Ca | ICP Assay | 3109a | 130213 |
| | Ca | EDTA | 928 | 928 |
| | Co | ICP Assay | 3113 | 190630 |
| | Co | EDTA | 928 | 928 |
| | Cr | ICP Assay | 3112a | 170630 |
| | Cu | ICP Assay | 3114 | 120618 |
| | Cu | EDTA | 928 | 928 |
| | Fe | ICP Assay | 3126a | 140812 |
| | Fe | EDTA | 928 | 928 |
| | K | ICP Assay | 3141a | 140813 |
| | K | Gravimetric | | See Sec. 4.2 |
| | Mg | ICP Assay | 3131a | 140110 |
| | Mg | EDTA | 928 | 928 |
| | Mn | ICP Assay | 3132 | 050429 |
| | Mn | EDTA | 928 | 928 |
| | Na | ICP Assay | 3152a | 200413 |
| | Na | Gravimetric | | See Sec. 4.2 |
| | Ni | ICP Assay | 3136 | 120619 |
| | Ni | EDTA | 928 | 928 |
| | 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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

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

Characterization of CRM/RM by One Method

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

Xa = mean of Assay Method A with

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

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

k = coverage factor = 2

u_{char a} = the errors from characterization

 $\mathbf{u_{bb}}$ = 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)

6.0 **INTENDED USE**

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

Note: This solution contains Silver (Ag), please refer to our Sample Preparation Guide for more information (https://www.inorganicventures.com/sample-preparation-guide/samples-containing-silver)

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 22, 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

- May 22, 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: | |
|-----------------------------|--|
| | |

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

Justin Dirico Stock Processing Supervisor Juster Dilies

Juster Dilies

Jahr Wall

Paul R Saines

Certificate Approved By:

Jodie Wall Stock VSM Coordinator

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

⁻ 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.



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: QCP-CICV-2 Lot Number: U2-MEB733713

Matrix: 3% (w/v) Tartaric acid

1% (v/v) HNO3

Value / Analyte(s): 500 µg/mL ea:

Antimony

Second Source: Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE

Antimony, Sb 500.0 \pm 2.8 μ g/mL

Density: 1.017 g/mL (measured at 20 \pm 4 °C)

Assay Information:

 ANALYTE
 METHOD
 NIST SRM#
 SRM LOT#

 Sb
 ICP Assay
 3102a
 140911

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:

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

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

 \mathbf{w}_i = the weighting factors for each method calculated using the inverse square of

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

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

 $\mathbf{u}_{\mathbf{char}} = [\Sigma((\mathbf{w}_i)^2 (\mathbf{u}_{\mathbf{char}})^2)]^{1/2}$ where $\mathbf{u}_{\mathbf{char}}$ are the errors from each characterization method

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

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_a = mean of Assay Method A with

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

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

k = coverage factor = 2

 $\mathbf{u}_{\mathbf{char}\;\mathbf{a}}$ = the errors from characterization

 $egin{align*} \mathbf{u_{bb}} &= \mathrm{bottle} \ \mathrm{to} \ \mathrm{bottle} \ \mathrm{homogeneity} \ \mathrm{standard} \ \mathrm{uncertainty} \ \mathbf{u_{lts}} &= \mathrm{long} \ \mathrm{term} \ \mathrm{stability} \ \mathrm{standard} \ \mathrm{uncertainty} \ (\mathrm{storage}) \ \end{aligned}$

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)

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 01, 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 01, 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: | |
|-----------------------------|--|
| - Sealed ICI Day Open Dale. | |

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

20178Ci.



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: QCP-CICV-3

Lot Number: V2-MEB749572

Matrix: 7% (v/v) HNO3

Value / Analyte(s):

500 μg/mL ea:

Arsenic, Lead, Selenium, Thallium,

250 μg/mL ea: Cadmium

Second Source: Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Arsenic, As 500.0 \pm 3.1 μ g/mL Cadmium, Cd 250.1 \pm 1.1 μ g/mL Lead, Pb 500.0 \pm 2.3 μ g/mL Selenium, Se 500.0 \pm 3.2 μ g/mL

Thallium, TI 500.0 \pm 3.0 μ g/mL

Density: 1.040 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

 $egin{align*} \mathbf{u_{bb}} = \mathbf{bottle} \ \mathbf{to} \ \mathbf{bottle} \ \mathbf{homogeneity} \ \mathbf{standard} \ \mathbf{uncertainty} \ \mathbf{u_{lts}} = \mathbf{long} \ \mathbf{term} \ \mathbf{stability} \ \mathbf{standard} \ \mathbf{uncertainty} \ (\mathbf{storage}) \ \end{aligned}$

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:

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

Xa = mean of Assay Method A with

 $\mathbf{u}_{\mathbf{char}\ \mathbf{a}}$ = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u_{char a} = the errors from characterization

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

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

ΝΙ/Δ

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 02, 2025

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

11.2 Lot Expiration Date

- January 02, 2030
- 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: | |
|-----------------------------|--|
| | |

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

Justin Dirico Stock Processing Supervisor

Juster Dilies Juster Wall Parel R. Laines

Certificate Approved By:

Jodie Wall Stock VSM Coordinator

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

⁻ 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.

Certified Reference Material CRM

M6030



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

R = 8 | 5 | 24

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

800-368-1131

Absolute Standards, Inc.

Part Number: Solvent: 24002546 Lot # Nitric Acid

Lot Number: Description: 57047 122823 Silver (Ag)

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

Weight shown below was diluted to (mL): 4000.30

1. Silver nitrate (Ag)

IN035 J0612AGA1

1000.0

0.10

63.7

6.27992

6.27998

1000.0

2.0

7761-88-B

10 ug/m3

Z

3151

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

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

Formulated By:

Benson Chan

122823

122823

Reviewed By: Pedro L. Rentas

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

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

www.absolutestandards.com



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

Physical Characterization:

(T)= Target analyte

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

Certified by:

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

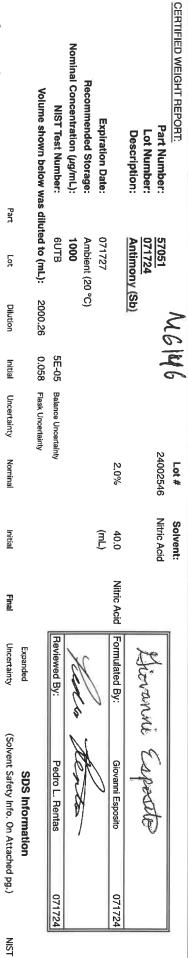
Lot # 071724

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



R:10/18/24 Certified Reference Material CRM

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



Compound

Number

Number

Factor

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

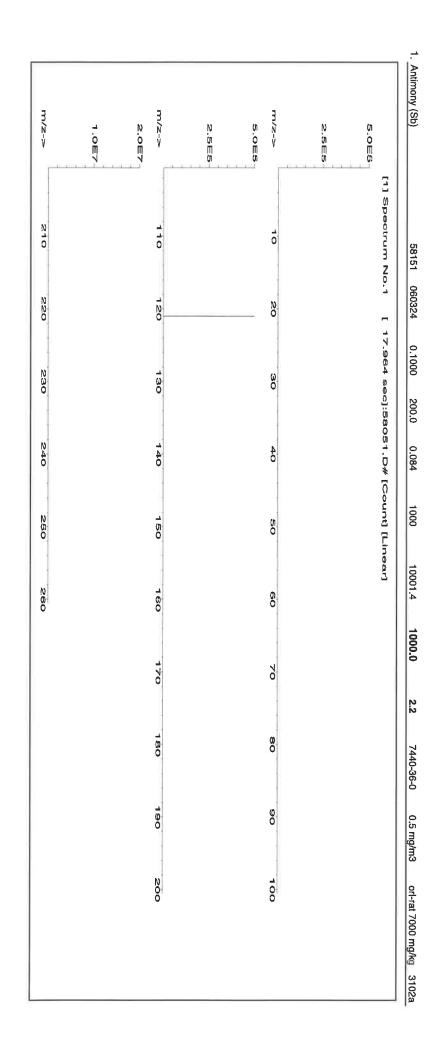
+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM



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

| | l | | П | | Н | | | Trace M | etals | Verifica | | by ICP-M | S (µg | J/mL) | | | | | | |
|---|---------------|-------|-----|-------|-----|-------|----|---------|-------|----------------------|----------|----------|-------|-------|----|-------|----|-------|----|-------|
| | | | 2 | | | | | | | | | | | | | | | | | |
| _ | <u>A</u> | <0.02 | δ | <0.02 | Dy | <0.02 | Hf | <0.02 | Ľ | <0.02 | Z | <0.02 | Pr | <0.02 | Se | <0.2 | Тъ | <0.02 | W | <0.02 |
| - | ď | Т | Ca | <0.2 | 턴 | <0.02 | Но | <0.02 | Ľ | <0.02 | ¥ | <0.02 | Re | <0.02 | Si | <0.02 | Te | <0.02 | q | <0.02 |
| _ | As | <0.2 | ဂ္ဂ | <0.02 | En | <0.02 | ln | <0.02 | Mg | <0.01 | ွ | <0.02 | Rh | <0.02 | A9 | <0.02 | ⊒ | <0.02 | < | <0.02 |
| _ | Ва — | <0.02 | ß | <0.02 | 8 | <0.02 | lr | <0.02 | Mn | <0.02 | Pd | <0.02 | Rb | <0.02 | Na | <0.2 | Ŧ | <0.02 | ΥЪ | <0.02 |
| _ | _{ве} | <0.01 | 다 | <0.02 | Ga | <0.02 | Fe | <0.2 | Hg | <0.2 | P | <0.02 | Ru | <0.02 | Sr | <0.02 | Tm | <0.02 | × | <0.02 |
| | В | <0.02 | Ç | <0.02 | င္စ | <0.02 | La | <0.02 | Мо | <0.02 | Pt | <0.02 | Sm | <0.02 | s | <0.02 | Sn | <0.02 | Zn | <0.02 |
| | В | <0.02 | δ | <0.02 | Au | <0.02 | Pb | <0.02 | M | <0.02 | × | <0.2 | Sc | <0.02 | Ta | <0.02 | 11 | <0.02 | Zr | <0.02 |
| | | | | | | | | | | (T) – Target analyte | et analy | do. | | | | | | | | |

(I) = larget analyte

Physical Characterization:

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

Certified by:

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

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

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

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

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

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

"An ISO 9001:2015 Certified Program"



Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

N6152

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

Page 1 of 2

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

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

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



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



Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

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

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

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

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

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



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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request M6153

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

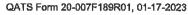
QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

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

Page 1 of 2











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

APTIM

Instructions for QATS Reference Material: ICP-AES ICS

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

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

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

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

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

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

| Element | CRQL | Part A (µg/L) | Low Limit (µg/L) | High Limit (µg/L) | Part A +Part B (µg/L) | Low Limit (µg/L) | High Limit (µg/L) |
|---------|------|------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
| Al | 200 | 255000 | 216000 | 294000 | 247000 | 209000 | 285000 |
| Sb | 60 | (0.0) | -60.0 | 60.0 | 618 | 525 | 711 |
| As | 10 | (0.0) | -10,0 | 10.0 | 104 | 88.4 | 120 |
| Ва | 200 | (6.0) | -194 | 206 | (537) | 337 | 737 |
| Be | 5.0 | (0.0) | -5.0 | 5.0 | 495 | 420 | 570 |
| Cd | 5.0 | (1.0) | -4.0 | 6.0 | 972 | 826 | 1120 |
| Ca | 5000 | 245000 | 208000 | 282000 | 235000 | 199000 | 271000 |
| Cr | 10 | (52.0) | 42.0 | 62.0 | 542 | 460 | 624 |
| Co | 50 | (0.0) | -50.0 | 50.0 | 476 | 404 | 548 |
| Cu | 25 | (2.0) | -23.0 | 27.0 | 511 | 434 | 588 |
| Fe | 100 | 101000 | 85600 | 116500 | 99300 | 84400 | 114500 |
| Pb | 10 | (0.0) | -10.0 | 10.0 | (49.0) | 39.0 | 59.0 |
| Mg | 5000 | 255000 | 216000 | 294000 | 248000 | 210000 | 286000 |
| Mn | 15 | (7.0) | -8.0 | 22.0 | 507 | 430 | 584 |
| Ni | 40 | (2.0) | -38.0 | 42.0 | 954 | 810 | 1100 |
| Se | 35 | (0.0) | -35.0 | 35.0 | (46.0) | 11.0 | 81.0 |
| Ag | 10 | (0.0) | -10.0 | 10.0 | 201 | 170 | 232 |
| TI | 25 | (0.0) | -25.0 | 25.0 | (108) | 83.0 | 133 |
| V | 50 | (0.0) | -50.0 | 50.0 | 491 | 417 | 565 |
| Zn | 60 | (0.0) | -60.0 | 60.0 | 952 | 809 | 1095 |

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

| a | | | |
|-----|--|--|--|
| - 8 | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |



Certificate of Analysis

ustry. R: 8/5/24

M6019

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGSR1

Lot Number:

U2-SR730227

Matrix:

0.1% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea:

Strontium

Starting Material:

SrCO3

Starting Material Lot#:

M2-2192

Starting Material Purity:

99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

1001 ± 3 µg/mL

Density:

1.000 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

998 ± 4 µg/mL

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

Assay Method #2

1001 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

1001 ± 2 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRM/RM}, 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 uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty (stora

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

X_a = mean of Assay Method A with

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

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 03, 2023

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

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

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director 20178hi



Certificate of Analysis

ustry. R: 8/5/24

M6019

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGSR1

Lot Number:

U2-SR730227

Matrix:

0.1% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea:

Strontium

Starting Material:

SrCO3

Starting Material Lot#:

M2-2192

Starting Material Purity:

99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

1001 ± 3 µg/mL

Density:

1.000 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

998 ± 4 µg/mL

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

Assay Method #2

1001 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

1001 ± 2 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRM/RM}, 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 uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty (stora

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

X_a = mean of Assay Method A with

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

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 03, 2023

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

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

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director 20178hi

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

M6023

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

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

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

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

CAS#

OSHA PEL (TWA)

LD50

SRM

| -z/m | 5.0E5 | 1.0E6 | m/z-> | 5000 | 1.0€4 | 1.0E6 | 2.0E6 | |
|------|-------|-------|----------|------|----------|-------|---|--|
| N | | | -1 | | | | El opegrum No. | |
| 210 | | | 10 | | ö | | 3 | |
| 220 | | | 120 | | N O | | | |
| | | | | | | | 4 0 | |
| 230 | | | 130 | | 9 | | []4.044 sec]:57081.D# [Count] [Linear] | |
| 240 | | | <u> </u> | | 4 | | 57081. | |
| ō | | | 140 | | 40 | | <u> </u> | |
| 250 | | | 1 | | OI. | | | |
| | | | | | | | | |
| N | | | 160 | | 60 | | | |
| | | | 4 | | 70 | | | |
| | | | 170 | | 0 | | | |
| | | | 180 | | 80 | | | 1000 |
| | | | | | | | | |
| | | | 190 | | 90 | | | or any |
| | | | 200 | | 100 | | | |
| | | | ŏ | | ŏ | | | See all see al |
| | | | | | | | | 0 |

Part # 57081



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

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

| | | ᄧ | 10 | Ħ. | Ве | , to | ಸ ತ | AS | | Sb | | <u>></u> | | Ī | _ | |
|----------------------|-------|----------|---------------|---------------|--------------|------------------|--------------|---------------|--------------|----------|----------|---------------------|--|-----------|--|--|
| | | 40.02 | 20.02 | 3 | <u>6</u> .01 | 70.02 | 3 | 4.6 | 5 | <u> </u> | | 40.02 | The Particular Street of the Particular Street | | | |
| | ŀ | ဂ္ | 8 |) | ç | Ç | 3 | g | <u> </u> | ري و | - | 2 | | | | |
| | | 40.02 | 20.02 | | A).03 | 20.03 | 3 | 40.02 | | <u>ه</u> | 10.01 | 20.02 | | | | |
| | | A | Ç, | 9 | <u>.</u> | Ga | 2 | ᄪ | 1 1 | Į | 5 | 7 | STATE STATES | l | | |
| | 20,02 | 3 | 40.02 | 0.01 | 3 | 20.02 | 3 | ∆ 0.02 | 6 6 6 | A) (2) | 10.04 | 2000 | SCP SERVING SHARES | | | |
| | 1 | 7 | La | , | <u>F</u> 1 | = | • | ď | 110 | 드 | 121 | 30 | | | - | |
| | 70.02 | 3 | ∆ 0.02 | ć | 2 | 40.02 | | ∆ .02 | 20.02 | 3 | 20.02 | 200 | | ומכב ואונ | | |
| | | Ž | Mo | 21.1 | E . | Mn | q | Mφ | 100 | Ţ | E | | | Scalo | 7 | |
| (T) = Target analyte | 70.02 | 3 | <u>8</u> ,02 | 7.0 | 5 | 40.02 | | <u>A</u> | 70.02 | 3 | 20.02 | | | ACHILICA | くいけい | |
| jet anal | 2 | 4 | 7 | 7 | , | Pd | - 6 | ွ | ONI | ź | 2 | | I | |) | |
| yte e | 20.2 | b | <u>\$</u> | 20,02 | Š | <0.02 | 10,01 | 3 | 20.02 | 3 | 40.02 | | | Dy ICP- | 2 | |
| | Sc | | S E | č | ; | 2 | Ĭ | P. | Ke | ; | - | | | MU C | | |
| | A0.02 | 20.02 | 3 | 40.02 | | < 0.02 | 10.04 | 3 | 20,02 | | <u>ه</u> | | ŀ | Jg/mL) | | |
| | Ta | , | , | Si | | Z | 76 | <u> </u> | S | ? | ဇ္ဇ | | l | | | |
| | 40,02 | 10.02 | 3 | ∆.02 | i | 40.2 | 20.02 | 3 | 40.02 | 1 | 802 | | | | | |
| | Ti | 100 | ? | ď | i | 7 | П | 1 | Te | | 7 | | | | | |
| | 40.02 | 70.02 | 3 | 40.02 | 40,04 | AD 03 | _ | 3 | <u>6</u> ,02 | 40.00 | AD 073 | | | | | |
| | Zr | 112 | 7 | × | ć | ş | < | ă Y | _ _ | | W. | THE PERSON NAMED IN | | | | |
| | 40.02 | 20.02 | 3 | ∆ 0.02 | 70.02 | 3 | ∆ .02 | | A 0.02 | 20.02 | 28 | THE PERSON NAMED IN | | | The second secon | |

Physical Characterization:

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

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

M6021

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

CERTIFIED WEIGHT REPORT Part Number: Lot Number: 57023 062424 24002546 Nitric Acid Solvent:

Nitric Acid

Ambient (20 °C) 2.0% (III) 40.0

Formulated By:

Aleah O'Brady

062424

ASSET O DE LONG

Recommended Storage:

Expiration Date:

062427

Description:

Vanadium (V)

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): NIST Test Number: **6UTB** 1000 2000.3 5E-05 0.06 Balance Uncertainty Flask Uncertainty Reviewed By:

Pedro L. Rentas

062424

Ammonium metavanadate (V) Compound 58123 Number Part 021224 Number ρţ 0.1000 Dilution Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) 200.0 Initial Uncertainty 0.084 Nominal 1000 Conc. (µg/mL) Conc. (µg/mL) 10000.3 nitial 1000.0 Final +/- (µg/mL) Uncertainty Expanded 22 7803-55-6 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) 0.05 mg/m3 **SDS Information** orl-rat 58.1mg/kg LD50 3165 NIST SRM

| V-4 K | 2.588 | m/z->- 5.0E8 | 1.0E7 | m/z-> | 1.006 | 2.006 |
|-------|-------|-----------------|-------|-------|-------|-------|
| | | | | | | |
| 210 | | 110 | | ō | | |
| 220 | | 1 0 | | N. | | |
| 0 | | 0 | | | | |
| NGO | | 130 | | 30 | | |
| 240 | | 140 | | 4.0 | | |
| 0 | | | | | | |
| 000 | | 150 | | 50 | | |
| 260 | | 160 | | 60 | | ı |
| 0 | | 0 | | | | |
| | | 170 | | 70 | | |
| | | 180 | | 80 | | |
| | | C | | | | |
| | | 190 | | 90 | | |
| | | 200 | | 100 | | |
| | | C | | O | | |

Part # 57023

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

| | E | <u> B</u> | Ве | Ва | AS | . 20 | 2 2 | 2 | | |
|----------------------|--|-----------|-------|-------------------|---------------|---------------|---------------|-------------------------|----------|---|
| | 40,02 | 80,00 | 40.01 | A).03 | 40.2 | 20.02 | 8 6 5 | A PA | | |
| | 5 | ပ | 유 | సి | દ | <u></u> | ۶ د | 2 | | |
| | 40.02 | 40.02 | <0.02 | 40.02 | 40.02 | 40.2 | 20.02 | 3 | | |
| | Au | ဝူ | స్ట | 8 | Ē | 먁 | ي ر | | | |
| | 40.02 | 40.02 | 40,02 | <0.02 | 40.02 | <0.02 | 20.02 | | | |
| | 3 | Ľ | 737 | 5 | 급 | Но | H | | | |
| | 40.02 | 40.02 | 40,2 | 0.02 | 40.02 | ∆ .02 | 40.02 | | Trace M | |
| | 곱 | Mo | He | Mn | Mg | 댭 | Σ | | etals | |
| (T) = Target analyte | 40.02 | 40.02 | 402 | 40,02 | 10.0 | 40.02 | 40.02 | | Verifica | |
| et analy | ~ | ₽ | P | 2 | ဝ္ဂ | Z | Z | | tion | |
| 6 | A0,2 | A).02 | A).02 | & 0.02 | ∆ 0.02 | 40,02 | 40.02 | INTERNATIONAL PROPERTY. | oy ICP-N | |
| | Sc | SB | 7 | 공 - | 7 | Re | 7 | | SI) SI | |
| | 40.02 | A (| A | 40.02 | A 0.02 | <0.02 | <0.02 | | /mL) | |
| | ng (| so s | ? | Z, | Ag | ī. | Se. | | | |
| | 40.02 | A) 65 | 3 6 | 40.2 | 40.02 | 8.02 | <0.2 | | | |
| | # 1 | S . | 1 | 3 : | i | e e | 4T | THE OWNER WHEN | | l |
| | 40.02 | A 60 5 | 5 6 6 | 200 | 4 | A 0.02 | <0.02 | STATE OF STATE OF | | |
| | 27 | 7, | < 5 | \$. | < | q | ¥ | SALES IN SALES | | |
| | 6.65 6.65 6.65 6.65 6.65 6.65 6.65 6.65 | 3 5 | 3 6 | 3 · | -3 | A 22 | ∆ 0.02 | Service Company | | |

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).