

Prep Standard - Chemical Standard Summary

Order ID : P4868

Test : Mercury, Metals ICP-TAL

Prepbatch ID : PB165011,PB165066,

Sequence ID/Qc Batch ID: LB133490,LB133502,LB133540,

Standard ID :

MP73080,MP83078,MP83079,MP83081,MP83082,MP83083,MP83084,MP83085,MP83086,MP83087,MP83088,MP830 91,MP83092,MP83105,MP83280,MP83281,MP83282,MP83283,MP83284,MP83285,MP83286,MP83287,MP83288,MP 83289,MP83290,MP83291,MP83292,MP83294,

Chemical ID :

M5062,M5130,M5192,M5218,M5223,M5288,M5295,M5296,M5390,M5394,M5404,M5429,M5467,M5498,M5515,M5658 ,M5697,M5698,M5747,M5748,M5769,M5798,M5799,M5800,M5801,M5802,M5806,M5814,M5815,M5816,M5817,M581 8,M5819,M5820,M5875,M5882,M5953,M5962,M5970,M5978,M5982,M5984,M5985,M6000,M6009,M6021,M6023,M60 28,M6030,M6033,M6111,M6117,M6120,M6121,W2606,W3112,



| Recipe ID 903 FROM | NAME ICP AES RINSE SOLN 200.00000ml of M5404 + 9800.00000 | <u>NO.</u> <u>MP73080</u> Oml of W260 | Prep Date 12/27/2022 06 = Final Qu | Expiration Date 01/08/2023 antity: 10000.0 | Prepared By Bin He | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | Sarabjit Jaswal 12/28/2022 |
|-----------------------------------|---|---|--|---|---|------------------------|--|-------------------------------|
| <u>Recipe</u> <u>ID</u> 902 | NAME ICP AES CAL BLK (SO/ICB/CCB) | <u>NO.</u> MP83078 | Prep Date 11/06/2024 | Expiration Date 12/06/2024 | <u>Prepared</u> <u>By</u> Kareem Khairalla | <u>ScaleID</u> None | <u>PipetteID</u> None | Sarabjit Jaswal 11/07/2024 |

FROM 125.00000ml of M6111 + 2350.00000ml of W3112 + 25.00000ml of M6117 = Final Quantity: 2500.000 ml



| Recipe ID 907 | NAME ICP AES STD S (S5) | <u>NO.</u> <u>MP83079</u> | Prep Date 11/06/2024 | Expiration Date 12/06/2024 | Prepared By Kareem Khairalla | <u>ScaleID</u> None | PipetteID None | Sarabjit Jaswal |
|---------------------|---|------------------------------|-------------------------|----------------------------------|---------------------------------------|------------------------|-------------------|-----------------|
| <u>FROM</u> | 5.00000ml of M5296 + 5.00000ml of of M5875 + 5.00000ml of M5970 + 5. | | | | | | |)0ml |
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| Pocino | | | | Expiration | Proparad | | | Supervised By |

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|---------------|----------------------------------|----------------|---------------|-------------------|-----------------|----------------|-----------|-----------------|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | PipetteID | Sarabjit Jaswal |
| 909 | ICP AES STD S3 | <u>MP83081</u> | 11/06/2024 | 12/06/2024 | Kareem | None | None | |
| | | | | | Khairalla | | | 11/07/2024 |
| FROM | 25.00000ml of MP83079 + 75.00000 | ml of MP830 |)78 = Final Q | uantity: 100.00 | 0 ml | | | |
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| Recipe ID 3913 FROM | NAME ICP AES STD S2 16.00000ml of MP83079 + 184.0000 | <u>NO.</u> MP83082 0ml of MP83 | <u>Prep Date</u> 11/06/2024 3078 = Final | Expiration Date 12/06/2024 Quantity: 200.0 | Prepared By Kareem Khairalla 00 ml | <u>ScaleID</u> None | PipettelD None | Sarabjit Jaswal 11/07/2024 |
|------------------------------|--|--------------------------------------|--|---|--|------------------------|-------------------|-------------------------------|
| Recipe ID 2950 | NAME ICP AES S1/CRI STOCK STD | <u>NO.</u> MP83083 | Prep Date 11/06/2024 | Expiration Date 12/06/2024 | Prepared By Kareem Khairalla | <u>ScaleID</u> None | PipettelD None | Sarabjit Jaswal |

 FROM
 0.03000ml of M5798 + 0.03000ml of M6028 + 0.05000ml of M5515 + 0.05000ml of M5658 + 0.05000ml of M6030 + 0.05000ml of M6033 + 0.06000ml of M5747 + 0.10000ml of M5697 + 0.10000ml of M5698 + 0.10000ml of M5801 + 0.10000ml of M5820 + 0.10000ml of M5962 + 0.10000ml of M5970 + 0.10000ml of M5982 + 0.15000ml of M5800 + 0.20000ml of M5748 + 0.20000ml of M5799 + 0.20000ml of M5819 + 0.20000ml of M6021 + 0.20000ml of M6023 + 0.25000ml of M5467 + 0.25000ml of M5802 + 0.50000ml of M5830 + 0.50000ml of M5814 + 1.00000ml of M5192 + 1.0000ml of M5288 + 1.00000ml of M5498 + 1.00000ml of M5769 + 1.00000ml of M5806 + 1.00000ml of M5978 + 2.00000ml of M5816 + 2.00000ml of M5818 + 77.68000ml of MP83078 = Final Quantity: 100.000 ml



| Recipe ID 2951 | NAME ICP AES S1/CRI WORK STD | <u>NO.</u> MP83084 | Prep Date 11/06/2024 | Expiration Date 12/06/2024 | Prepared By Kareem Khairalla | <u>ScaleID</u> None | <u>PipetteID</u> None | Sarabjit Jaswal |
|----------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|---------------------------------------|------------------------|--------------------------|-----------------|
| FROM | 2.00000ml of MP83083 + 98.00000m | nl of MP8307 | 78 = Final Qu | antity: 100.000 | ml | | | |

| Recipe ID 912 | NAME ICP AES ICV SOLN | <u>NO.</u> <u>MP83085</u> | Prep Date 11/06/2024 | Expiration Date 12/06/2024 | <u>Prepared</u> <u>By</u> Kareem Khairalla | <u>ScaleID</u> None | <u>PipetteID</u> None | Sarabjit Jaswal |
|---------------------|---|------------------------------|--------------------------------|----------------------------------|---|------------------------|--------------------------|-----------------|
| <u>FROM</u> | 0.02500ml of M5429 + 0.02500ml of of M5295 + 89.77500ml of MP83078 | | | |)ml of M5218 + | 0.25000ml of M | 5982 + 10.000 | 100ml |
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| Recipe ID 904 | NAME ICP AES ICSA SOLN | <u>NO.</u> MP83086 | Prep Date 11/06/2024 | Expiration Date 11/19/2024 | <u>Prepared</u> <u>By</u> Kareem Khairalla | <u>ScaleID</u> None | <u>PipetteID</u> None | Sarabjit Jaswal |
|---------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|---|------------------------|--------------------------|-----------------|
| FROM | 25.00000ml of M5130 + 225.00000m | I of MP8307 | 8 = Final Qu | antity: 250.000 | ml | | | |
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| Recipe ID 3494 | NAME ICP AES ICSAB SOLN-1 | <u>NO.</u> <u>MP83087</u> | Prep Date 11/06/2024 | Expiration Date 11/19/2024 | Prepared By Kareem Khairalla | <u>ScaleID</u> None | PipetteID None | Sarabjit Jaswal |
|----------------------|---|------------------------------|-------------------------|----------------------------------|---------------------------------------|------------------------|-------------------|-----------------|
| FROM | 0.01000ml of M5815 + 0.01000ml of of M5130 + 10.00000ml of M5223 + 7 | | | | | 1.00000ml of M | 15982 + 10.000 |)00ml |



| Recipe ID 911 | NAME ICP AES CCV SOLN | <u>NO.</u> MP83088 | Prep Date 11/06/2024 | Expiration Date 12/06/2024 | <u>Prepared</u> <u>By</u> Kareem Khairalla | <u>ScaleID</u> None | <u>PipetteID</u> None | Sarabjit Jaswal |
|---------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|---|------------------------|--------------------------|-----------------|
| FROM | 50.00000ml of MP83078 + 50.00000 | ml of MP83(| 079 = Final Q | uantity: 100.00 | 0 ml | | | |

| <u>Recipe</u> <u>ID</u> | NAME | <u>NO.</u> | Prep Date | Expiration Date | <u>Prepared</u> <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | <u>Supervised By</u> Sarabjit Jaswal |
|----------------------------|-----------------------------------|----------------|-------------|--------------------|------------------------------|----------------|------------------|---|
| 919 | ICP AES INTERNAL STD | <u>MP83091</u> | 11/06/2024 | 12/06/2024 | Kareem Khairalla | None | None | 11/07/2024 |
| FROM | 1.00000ml of M5984 + 10.00000ml o | f M5985 + 1 | 969.00000ml | of W3112 + 20 | .00000ml of M6 | 117 = Final Qu | antity: 2000.00 |)0 ml |
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| Recipe ID 513 | NAME RINSE SOLN | <u>NO.</u> MP83092 | Prep Date 11/06/2024 | Expiration Date 12/06/2024 | Prepared By Kareem Khairalla | <u>ScaleID</u> None | PipetteID None | Sarabjit Jaswal |
|---------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|---------------------------------------|------------------------|-------------------|-----------------|
| <u>FROM</u> | 200.00000ml of M6117 + 9800.0000 |)ml of W311 | 2 = Final Qua | antity: 10000.00 | 00 ml | | | |
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| Recipe | | | | Expiration | Prepared | | | Supervised By |
|---------------|-----------------------------------|----------------|---------------|-------------------|-------------|----------------|-----------|-----------------|
| ID | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | PipettelD | Sarabjit Jaswal |
| 170 | 1:1HCL | <u>MP83105</u> | 11/07/2024 | 12/06/2024 | Janvi Patel | None | None | - |
| | | | | | | | | 11/07/2024 |
| FROM | 1000.00000ml of M6111 + 1000.0000 | 0ml of W31 | 12 = Final Qu | uantity: 2000.00 |)0 ml | | | |
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| Recipe ID 871 | NAME MERCURY INTERMEDIATE B 250PPB WORKING STD. | <u>NO.</u> MP83280 | Prep Date 11/18/2024 | Expiration Date 11/19/2024 | Prepared By Mohan Bera | <u>ScaleID</u> None | PipettelD METALS_PIP ETTE_5 (HG | |
|---------------------|---|-----------------------|-------------------------|----------------------------------|------------------------------|------------------------|---------------------------------------|--|
| <u>FROM</u> | I 1.00000ml of M6120 + 2.50000ml of | M5062 + 96 | 5.50000ml of V | V3112 = Final | Quantity: 100.0 | 00 ml | A) | |
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| <u>Recipe</u> <u>ID</u> | NAME | <u>NO.</u> | Prep Date | Expiration Date | <u>Prepared</u> <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | <u>Supervised By</u> Sarabjit Jaswal |
|----------------------------|----------------------------------|----------------|---------------|--------------------|------------------------------|----------------|--------------------------|---|
| 1340 | Hg 0.00 PPB STD | <u>MP83281</u> | 11/18/2024 | 11/19/2024 | Mohan Bera | None | METALS_PIP ETTE_5 (HG | - |
| FROM | 2.50000ml of M6120 + 247.50000ml | of W3112 = | Final Quantit | y: 250.000 ml | | | A) | |
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| Recipe ID 1341 FROM | NAME Hg 0.2 PPB STD 2.50000ml of M6120 + 247.30000ml | <u>NO.</u> MP83282 of W3112 + | Prep Date 11/18/2024 0.20000ml of | Expiration Date 11/19/2024 MP83280 = F | Prepared By Mohan Bera inal Quantity: 25 | ScaleID None | PipetteID METALS_PIP ETTE_5 (HG A) | Supervised By Sarabjit Jaswal 11/18/2024 |
|------------------------------|--|-------------------------------------|---|---|---|-----------------|---|--|
| Recipe ID 1342 FROM | NAME Hg 2.5 PPB STD 2.50000ml of M6120 + 245.00000ml | <u>NO.</u> MP83283 | Prep Date 11/18/2024 2 50000ml of | Expiration Date 11/19/2024 | Prepared By Mohan Bera | ScaleID None | PipetteID METALS_PIP ETTE_5 (HG A) | Sarabjit Jaswal |



| Recipe ID 1343 FROM | NAME Hg 5.0 PPB STD 2.50000ml of M6120 + 242.50000ml | <u>NO.</u> MP83284 of W3112 + | Prep Date 11/18/2024 5.00000ml of | 11/19/2024 | Prepared By Mohan Bera inal Quantity: 25 | ScaleID None | PipetteID METALS_PIP ETTE_5 (HG A) | Supervised By Sarabjit Jaswal 11/18/2024 |
|------------------------------------|--|-------------------------------------|---|----------------------------------|---|------------------------|---|--|
| <u>Recipe</u> <u>ID</u> 1344 | NAME Hg 7.5 PPB STD | <u>NO.</u> MP83285 | <u>Prep Date</u> 11/18/2024 | Expiration Date 11/19/2024 | Prepared By Mohan Bera | <u>ScaleID</u> None | PipettelD METALS_PIP ETTE_5 (HG | Sarabjit Jaswal |
| FROM | 2.50000ml of M6120 + 240.00000ml | of W3112 + | 7.50000ml of | MP83280 = F | inal Quantity: 25 | 60.000 ml | <u>A)</u> | |



| <u>Recipe</u> <u>ID</u> 1345 | NAME Hg 10.0 PPB STD | <u>NO.</u> MP83286 | <u>Prep Date</u> 11/18/2024 | Expiration Date 11/19/2024 | Prepared By Mohan Bera | <u>ScaleID</u> None | <u>PipettelD</u> METALS_PIP ETTE_5 (HG | Sarabjit Jaswal |
|------------------------------------|----------------------------------|-----------------------|--------------------------------|----------------------------------|--|------------------------|--|---|
| <u>FROM</u> | 2.50000ml of M6120 + 237.50000ml | of W3112 + | 10.00000ml c | of MP83280 = | Final Quantity: 2 | 250.000 ml | · <u>A</u>) · | |
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| <u>Recipe</u> <u>ID</u> 1346 | | <u>NO.</u> MP83287 | Prep Date | Expiration Date | <u>Prepared</u> <u>By</u> Mohan Bera | <u>ScaleID</u> None | PipetteID | <u>Supervised By</u> Sarabjit Jaswal |

| | | | | | | <u></u> | | Sarabjit Jaswal |
|------|--------------------------------------|----------------|---------------|------------|------------------|---------|------------|-----------------|
| 1346 | Hg ICV SOLUTION | <u>MP83287</u> | 11/18/2024 | 11/19/2024 | Mohan Bera | None | METALS_PIP | |
| | | | | | | | ETTE_5 (HG | 11/18/2024 |
| FROM | 2.50000ml of M5953 + 2.50000ml of | M6120 ± 24 | 15 00000ml of | | l Quantity: 250 | 000 ml | - A) | |
| FROM | 2.50000111 01 105953 + 2.50000111 01 | 10120 + 24 | i5.00000mi 0i | | i Quantity. 250. | 000 mi | | |
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| <u>Recipe</u> <u>ID</u> 1351 | NAME ICB (Hg 0.00 PPB SOLUTION) | <u>NO.</u> <u>MP83288</u> | Prep Date 11/18/2024 | Expiration Date 11/19/2024 | Prepared By Mohan Bera | <u>ScaleID</u> None | PipettelD METALS_PIP ETTE_5 (HG | |
|------------------------------------|------------------------------------|------------------------------|-------------------------|----------------------------------|------------------------------|------------------------|---------------------------------------|---------------|
| FROM | 2.50000ml of M6120 + 247.50000ml | of W3112 = | Final Quantit | ry: 250.000 ml | | | A) | |
| Recipe | | | | Expiration | Prepared | | | Supervised By |

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|-----------|----------------------------------|----------------|--------------|-------------------|-------------------|----------------|------------|-----------------|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | PipetteID | Sarabjit Jaswal |
| 1358 | CCV (Hg 5.0 PPB SOLUTION) | <u>MP83289</u> | 11/18/2024 | 11/19/2024 | Mohan Bera | None | METALS_PIP | |
| | | | | | | | ETTE_5 (HG | 11/18/2024 |
| FROM | 485.00000ml of W3112 + 5.00000ml | of M6120 + | 10.00000ml c | of MP83280 = | Final Quantity: 8 | 500.000 ml | · A) · | |
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| <u>Recipe</u> <u>ID</u> 1352 | NAME CCB (Hg 0.00 PPB SOLUTION) | <u>NO.</u> MP83290 | Prep Date 11/18/2024 | Expiration Date 11/19/2024 | Prepared By Mohan Bera | <u>ScaleID</u> None | PipettelD METALS_PIP ETTE_5 (HG | Sarabjit Jaswal |
|------------------------------------|------------------------------------|-----------------------|-------------------------|----------------------------------|------------------------------|------------------------|---------------------------------------|---|
| <u>FROM</u> | 485.00000ml of W3112 + 5.00000ml | of M6120 = | Final Quantit | y: 500.000 ml | | | A) ' | |
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| <u>Recipe</u> <u>ID</u> | NAME | <u>NO.</u> | <u>Prep Date</u> | Expiration Date | <u>Prepared</u> <u>By</u> | <u>ScaleID</u> | <u>PipetteID</u> | <u>Supervised By</u> Sarabjit Jaswal |

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| abjit Jaswal |
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Metals STANDARD PREPARATION LOG

| Recipe ID 1350 FROM | NAME CHK STD (Hg 7.0 PPB SOLUTION) 2.50000ml of M6120 + 240.50000ml | <u>NO.</u> <u>MP83292</u> of W3112 + | Prep Date 11/18/2024 7.00000ml of | Expiration Date 11/19/2024 MP83280 = F | <u>Prepared</u> <u>Bγ</u> Mohan Bera inal Quantity: 25 | <u>ScaleID</u> None | PipetteID METALS_PIP ETTE_5 (HG A) | |
|------------------------------|--|--|---|---|---|---|---|-----------------|
| Recipe ID 68 | NAME STANNOUS CHLORIDE SOLUTION | <u>NO.</u> <u>MP83294</u> | Prep Date 11/18/2024 | Expiration Date 11/19/2024 | | <u>ScaleID</u> METALS_SCA LE_3 (M SC-3) | | Sarabjit Jaswal |

LE_3 (M SC-3) 450.00000ml of W3112 + 50.00000gram of M5882 + 50.00000ml of M6121 = Final Quantity: 500.000 ml FROM



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|--|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | MSHG-10PPM / MERCURY HCI 125mL 10ug/mL | S2-HG709270 | 09/22/2026 | 05/28/2022 / mohan | 01/27/2022 / mohan | M5062 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| EPA | PART A / ICSA (ICP) STOCK SOLN | ICSA-1211 | 11/19/2024 | 05/20/2024 / jaswal | 04/20/2021 / bin | M5130 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57042 / Mo, 1000 PPM, 125 ml | 051722 | 05/17/2025 | 07/01/2022 / bin | 06/17/2022 / jaswal | M5192 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti | S2-MEB711674 | 11/02/2026 | 07/01/2022 / bin | 09/10/2021 / bin | M5218 |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|----------|--------------------------------------|-----------|--------------------|----------------------------|--------------------------------|-------------------|
| EPA | PART B / ICSAB (ICP) STOCK SOLN | ICSB-0710 | 11/19/2024 | 05/20/2024 / jaswal | 04/20/2021 / bin | M5223 |
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| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 58119 / K, 10000 PPM, 500 ml | 071122 | 07/11/2025 | 09/01/2022 / jaswal | 07/21/2022 / jaswal | M5288 |
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| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|----------|---------------------------------------|----------|--------------------|----------------------------|--------------------------------|-------------------|
| EPA | ICV-1 / ICV (ICP/ICPMS) STOCK SOLN | ICV-1014 | 02/05/2025 | 08/07/2024 / jaswal | 02/20/2020 / bin | M5295 |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------|-----------------------------|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | Z9651Q / CHEM-CLP-4/.25L | S2-MEB711673 | 11/02/2026 | 09/19/2022 / jaswal | 08/20/2022 / jaswal | M5296 |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57056 / Ba, 1000 PPM, 125 ml | 072122 | 07/21/2025 | 08/07/2024 / jaswal | 09/18/2022 / bin | M5390 |
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| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------|--|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL | T2-MEB714159 | 01/13/2027 | 11/28/2022 / bin | 09/19/2022 / bin | M5394 |
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| 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) | 22C0462001 | 06/12/2023 | 12/20/2022 / Al-Terek | 02/11/2022 / Al-Terek | M5404 |
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| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57103 / Li, 10000 PPM, 125 ml | 070622 | 07/06/2025 | 01/30/2023 / bin | 01/26/2023 / bin | M5429 |



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CHEMICAL RECEIPT LOG BOOK

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| 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. | 58120 / Ca, 10000 PPM, 500 ml | 031523 | 03/15/2026 | 08/15/2023 / jaswal | 03/17/2023 / bin | M5498 |
| 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 | 092122 | 09/21/2025 | 08/01/2024 / Jaswal | 03/17/2023 / bin | M5515 |
| 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. | 58029 / Cu, 1000 PPM, 500 ml | 102523 | 10/25/2026 | 04/03/2024 / jaswal | 10/27/2023 / jaswal | M5697 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58025 / Mn, 1000 PPM, 500 ml | 102623 | 10/26/2026 | 04/18/2024 / jaswal | 10/27/2023 / jaswal | M5698 |



| 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. | 58112 / Mg, 10000 PPM, 500 ml | 091823 | 09/18/2026 | 05/24/2024 / Jaswal | 01/03/2024 / bin | M5769 |
| 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 / Received By | Chemtech Lot # |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | 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. | 57051 / Sb, 1000 PPM, 125 ml | 120523 | 12/05/2026 | 08/07/2024 / jaswal | 01/03/2024 / jaswal | M5802 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58111 / Na, 10000 PPM, 500 ml | 122223 | 12/22/2026 | 08/01/2024 / Jaswal | 01/03/2024 / jaswal | M5806 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57005 / B, 1000 PPM, 125 ml | 071123 | 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. | 57115 / P, 10000 PPM, 125 ml | 041723 | 04/17/2026 | 05/21/2024 / Jaswal | 02/09/2024 / jaswal | M5815 |
| 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. | 57116 / S, 10000 PPM, 125 ml | 071123 | 07/11/2026 | 03/01/2024 / jaswal | 02/09/2024 / jaswal | M5817 | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
| bsolute 57014 / Si, 1000 PPM, 125 Standards, Inc. ml | | 122023 | 12/20/2026 | 03/06/2024 / jaswal | 02/09/2024 / jaswal | M5818 | |
| Supplier | Supplier ItemCode / ItemName | | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
| Absolute Standards, Inc. | | | 11/16/2026 | 03/20/2024 / jaswal | 02/09/2024 / jaswal | M5819 | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
| Absolute Standards, Inc. | 57015 / P, 1000 PPM, 125 ml | 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 / Received By | Chemtech Lot # | |
| Inorganic Ventures | CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL | T2-MEB714417 | 01/27/2027 | 04/19/2024 / jaswal | 02/22/2024 / jaswal | M5875 | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
| Seidler Chemical | BA-3980-01 / Stannous Chloride (cs/4x500g) | 232820 | 08/31/2028 | 04/30/2024 / mohan | 04/25/2024 / mohan | M5882 | |



| Supplier | ItemCode / ItemName | | | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
|-----------------------------|---|-----------|--------------------|----------------------------|--------------------------------|-------------------|--|
| EPA | ICV-5 / ICV (HG)STOCK SOLN | ICV5-0415 | 01/01/2025 | 07/01/2024 / mohan | 03/30/2023 / mohan | M5953 | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
| Absolute Standards, Inc. | 57034 / Se, 1000 PPM, 125 ml | 060624 | 06/06/2027 | 07/02/2024 / Jaswal | 06/14/2024 / Jaswal | M5962 | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
| Absolute Standards, Inc. | s, Inc. 57003 / Li, 1000 PPM, 125 ml | | 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 | CGTI1-1 / TITANIUM 125mL 1000ug/mL | T2-TI719972 | 06/17/2027 | 08/07/2024 / jaswal | 02/22/2024 / Jaswal | M5978 |
| | | | | | | |

| 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 | 031524 | 03/15/2027 | 07/01/2024 / Jaswal | 06/11/2024 / Jaswal | M5982 |
| | | | | | | |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------|--|------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | CGY10-1 / YTTRIUM 125mL 10,000ug/mL | V2-Y740548 | 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 | | | 08/30/2026 | 08/13/2024 / Jaswal | 05/14/2024 / Jaswal | M6000 | |
| Supplier | Supplier ItemCode / ItemName | | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
| Inorganic Ventures | | | 03/17/2028 | 08/13/2024 / Jaswal | 05/14/2024 / Jaswal | M6009 | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date Opened / Date 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. | 57081 / TI, 1000 PPM, 125 ml | 0624724 | 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 | 01/25/2019 / Jaswal | M6028 | |
| | | | | | | | |

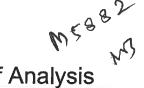


| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|------------|----------------------------------|---|--|----------------------------|
| Absolute Standards, Inc. | 57047 / Ag, 1000 PPM, 125 ml | 122823 | 12/28/2026 | 08/05/2024 / kareem | 08/05/2024 / Jaswal | M6030 |
| 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 | 011623 | 01/16/2026 | 08/07/2024 / Jaswal | 01/03/2024 / Jaswal | M6033 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Seidler Chemical | BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L) | 22F0762009 | 05/09/2027 | 11/04/2024 / Eman | 09/29/2024 / Janvi | M6111 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| | | | 1 | | 1 | |
| Seidler Chemical | BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L) | 24B1362001 | 05/06/2025 | 11/06/2024 / Janvi | 09/29/2024 / Eman | M6117 |
| Seidler Chemical Supplier | | 24B1362001 | 05/06/2025 Expiration Date | | | M6117 Chemtech Lot # |
| | Instra-Analyzed (cs/4x2.5L) | | Expiration | Janvi Date Opened / | Eman Received Date / | Chemtech |
| Supplier | Instra-Analyzed (cs/4x2.5L) ItemCode / ItemName BA-9598-34 / Nitric Acid, | Lot # | Expiration Date | Janvi Date Opened / Opened By 11/13/2024 / Eman | Eman Received Date / Received By 10/13/2024 / | Chemtech Lot # |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |
|------------------|---------------------|---------------------|--------------------|----------------------------|--------------------------------|-------------------|--|
| Seidler Chemical | DIW / DI Water | Daily Lab-Certified | 10/24/2024 | 10/24/2019 / apatel | 10/24/2019 / apatel | W2606 | |
| | | ii | | - | | | |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # | |

Certificate of Analysis Thermo Fisher SCIENTIFIC



Page 1 of 1

Certificate of Analysis 1 Reagent Lane Fair Lawn, NJ 07410 Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System 201,796,7100 tel Standard ISO9001:2015 by SAI Global Certificate Number CERT - 0120633 201.796.1329 fax

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

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

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

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Harout Sahagian - Quality Control Supervisor - Fair Lawn

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

*Based on suggested storage condition.

| m/z-> | 1.067 | m/z-> 2.0€7 | 5.014 | m/z-> 1.0E5 | 2.5E4 | 5. 0 114 | 1. Cadmium nitrate tetrahydrate (Cd) | Compound | Weight shov | Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): | | CERTIFIED WEIGHT REPORT: | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
|-------|-------|----------------|-------|----------------|-------|---------------------------------------|--------------------------------------|--|--|--|---|--------------------------|--|
| | | | | 0 0 | | [1] Spectrum No.1 | | RM# | Weight shown below was dliuted to (mL): | Expiration Date: nended Storage: ntration (µg/mL): | Part Number: Lot Number: Description: | PORT: | 1s, Inc. om |
| | | 120 | | 20 | | - | IN024 CDM092021A1 | Lot Number | 6UTB uted to (mL): | 070127 Ambient (20 °C) 1000 | <u>57048</u> <u>070124</u> Cadmium (Cd) | | |
| | | 130 | | 30 | | 12.514 800 | 1000 99. | Nominal Pu Conc. (µg/mL) (1 | 2000.07 0.1 | | (Cd) | | R |
| 200 | | 140 | | \$ | | 12.514 sec]:58148.D# [Count] [Linear] | 99.999 0.10 36.5 | Purity Uncertainty Assay (%) Purity (%) (%) | 5E-05 Balance Uncertainty 0.100 Flask Uncertainty | | Solvent: 2% | | Certified R |
| | | 1 () () | | ő | | Count] [Line | .5 5.4797 | say Target 6) Weight (g) | ţ | | ent: 24002546 2% 40.0 | Lot # | Certified Reference Material CRM S 15 12 4 |
| | | 160 | | 0 O | | ar] | 5.4804 | Actual Actual Weight (g) Conc. (µg/mL) | | | Nitric Acid | | terial CRM |
| | | 170 | | 70 | | | 1000.1 | 11 | Re | 5 | 5 | | M6028 |
| | | -1 2 C | | BO | | | 10022-68-1 | Expanded Uncertainty (Solvent +/- (µg/mL) CAS# 0 | Reviewed By: Ped | \$ | Alloch & B | | - |
| | | 190 200 | | 90 100 | | | | SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD51 | Pedro L. Rentas | ento | Brack | | ANAB IS AR-153 https://Ab |
| | | | | - | | | orl-rat 60.2mg/kg 3108 | ned pg.) NIST LD50 SRM | 070124 | | 070194 | | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |

1 of 2

Part # 57048

Lot # 070124

Printed: 8/1/2024, 2:13:25 PM





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

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

| | F | ₽ | B | DC | | Ŗ | AS | | Sb | A | | - | |
|----------------------|----------|----------|-------|-------|----------|-------|---------------|-------|-------|--------------|---|---------|----------|
| | 10.04 | 200 | <0.02 | <0.01 | | 3 | 202 | | 40.02 | <0.02 | 200 | | |
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| | 70.02 | 3 | 40.02 | <0.02 | 10.02 | 33 | 20.02 | | 3 | Т | ALC: NOT THE REAL OF THE REAL | | |
| | - AU | | Ş | Ga | n g | 5 | Ē | 1 | Ę | Dy | | | |
| | 20.02 | | 3 | <0.02 | SU.UZ | 3 | <0.02 | 10.02 | 3 | 40.02 | and the second second second | | |
| | 1-3 | 2 | 2 | 2 | - | r! | b | 110 | ç | Hf | Constant of | | _ |
| | 20.02 | 20.02 | 55 | <0.2 | 20.02 | 3 | A).02 | 20.02 | 3 | 40.02 | And a subscription | Ŀ | N OUK |
| | Nd | UTAT | Ş | Hg | MIN | | Mg | Ę | | E | C. NTALITY | | Aptalo |
| (T) = Target analyte | <0.02 | 20.02 | 200 | 40 i2 | <0.02 | 2 | 40 .01 | 70.05 | 5 | <0.02 | ALC: NO ALC: NO | | Varifics |
| yet anal | × | 2 | 2 | ٣ | Pd | ! | õ | NO | , | Ŋ | The state | | tion |
| vte | 40 2 | 20.02 | 5 | <0.02 | <0.02 | | <0.02 | <0.02 | | <0.02 | 一般的なもの | | |
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| | 40.02 | 20.02 | | <0.02 | <0.02 | | A0 03 | <0.02 | | 40.02 | | agrint) | |
| | Ta | s. | , ; | ş | Na | 9 | Ao | S | | Se | SOME NUMBER | | |
| | <0.02 | <0.02 | | 20.03 | <0.2 | 10.01 | 88 | <0.02 | | c (1> | ENVERTOR | | |
| | H | Sa | | j | ľ | | 3 | Te | | 77 | | | |
| | <0.02 | <0.02 | 10.0# | -0 N3 | <0.02 | 10.02 | 3 | <0.02 | 10.01 | SUP | The state was a state of the | | |
| | 27 | 2 | * | < | 4 | ~ | < | d | | W | N-SNO-N | | |
| | <0.02 | <0.02 | 70.02 | 3 | <0.02 | 20.02 | 3 | 40.02 | 20:01 | | Providential of the | | |

Physical Characterization:

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

In P. S.

Certified by:

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

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

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

e24

M5296 OP: 09/19/2022 BH



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: | CHEM-CLP-4 | | | |
| Lot Number: | S2-MEB711673 | | | |
| Matrix: | 3% (v/v) HNO3 3% (v/v) HF | | | |
| Value / Analyte(s): | 1 000 μg/mL ea: Boron, Silicon, Titanium | Molybdenum, Tin, | | |

3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE Boron, B | CERTIFIED VALUE 1 000 ± 6 μg/mL | ANALYTE Molybdenum, Mo | CERTIFIED VALUE 1 000 ± 6 μg/mL | | |
|---------------------|------------------------------------|---------------------------|------------------------------------|----------|--|
| Silicon, Si | 1 000 ± 7 μg/mL | Tin, Sn | 1 000 ± 6 µg/mL | | |
| Titanium, Ti | 1 000 ± 7 μg/mL | | | | |
| Density: | 1.030 g/mL (meas | sured at 20 ± 4 °C) | | | |
| Assay Information: | | | | | |
| ANALYTE | METHOD | NIST SRM# | | SRM LOT# | |
| B | ICP Assav | 3107 | | 110830 | |

| В | ICP Assay | 3107 | 110830 |
|----|-----------|-------|--------|
| Мо | ICP Assay | 3134 | 130418 |
| Si | ICP Assay | 3150 | 130912 |
| Sn | ICP Assay | 3161a | 140917 |
| Ti | ICP Assay | 3162a | 130925 |
| | | | |

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 | Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization |
|--|---|
| used is the weighted mean of the results: | is used is the mean of individual results: |
| $X_{CRM/RM} = \Sigma(w_i) (X_i)$ | X _{CRM/RM} = (X _a) (u _{char a}) |
| X _i = mean of Assay Method i with standard uncertainty u _{char i} | X _a = mean of Assay Method A with |
| w_i = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$ | u _{char} a = the standard uncertainty of characterization Method A |
| CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2} | CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² char a + u ² bb + u ² lts + u ² ts) ¹ |
| k = coverage factor = 2 | k = coverage factor = 2 |
| $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method | u _{char a} = the errors from characterization |
| ubb = bottle to bottle homogeneity standard uncertainty | u _{bb} = bottle to bottle homogeneity standard uncertainty |
| u _{lts} = long term stability standard uncertainty (storage) | ults = long term stability standard uncertainty (storage) |
| u _{te} = transport stability standard uncertainty | ute = transport stability standard uncertainty |

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

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

11.2 Lot Expiration Date

- November 02, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

3.0

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 So | lution |
|---------------------|---|-----------------------|
| Catalog Number: | CLPP-CAL-1 | |
| Lot Number: | T2-MEB714417 | |
| Matrix: | 5% (v/v) HNO3 | |
| Value / Analyte(s): | 5 000 μg/mL ea: Calcium, Magnesium, | Potassium, Sodium, |
| | 2 000 μg/mL ea: Aluminum, | Barium, |
| | 1 000 μg/mL ea: Iron, | |
| | 500 μg/mL ea: Nickel, Zinc, Manganese, | Vanadium, Cobalt, |
| | 250 μg/mL ea: Silver, | Copper, |
| | 200 μg/mL ea: Chromium, | |
| | 50 μg/mL ea: Beryllium | |
| CERTIFIED VALUE | S AND UNCERTAINTIES | |

| ANALYTE Aluminum, Al | CERTIFIED VALUE 2 000 ± 7 μg/mL | ANALYTE Barium, 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:

| ANALYTE Ag | METHOD ICP Assay | NIST SRM# 3151 | SRM LOT# 160729 |
|---------------|---------------------|-------------------|--------------------|
| Ag | Volhard | 999c | 999c |
| AI | ICP Assay | 3101a | 140903 |
| AI | EDTA | 928 | 928 |
| Ва | ICP Assay | 3104a | 140909 |
| Ва | Gravimetric | | See Sec. 4.2 |
| Ве | ICP Assay | 3105a | 090514 |
| Ве | Calculated | | See Sec. 4.2 |
| Са | ICP Assay | 3109a | 130213 |
| Са | EDTA | 928 | 928 |
| Со | ICP Assay | 3113 | 190630 |
| Со | 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 |
| К | ICP Assay | 3141a | 140813 |
| К | Gravimetric | | See Sec. 4.2 |
| Mg | ICP Assay | 3131a | 140110 |
| Mg | EDTA | 928 | 928 |
| Mn | ICP Assay | 3132 | 050429 |
| Mn | EDTA | 928 | 928 |
| Na | ICP Assay | 3152a | 120715 |
| Na | Gravimetric | | See Sec. 4.2 |
| Ni | ICP Assay | 3136 | 120619 |
| Ni | EDTA | 928 | 928 |
| 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 | Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization |
|--|---|
| used is the weighted mean of the results: | is used is the mean of individual results: |
| $X_{CRM/RM} = \Sigma(w_i) (X_i)$ | X _{CRM/RM} = (X _a) (u _{char a}) |
| X _i = mean of Assay Method i with standard uncertainty u _{char i} | X _a = mean of Assay Method A with |
| w_i = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$ | u _{char} a = the standard uncertainty of characterization Method A |
| CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2} | CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² char a + u ² bb + u ² lts + u ² ts) ¹ |
| k = coverage factor = 2 | k = coverage factor = 2 |
| $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method | u _{char a} = the errors from characterization |
| ubb = bottle to bottle homogeneity standard uncertainty | u _{bb} = bottle to bottle homogeneity standard uncertainty |
| u _{lts} = long term stability standard uncertainty (storage) | ults = long term stability standard uncertainty (storage) |
| u _{te} = transport stability standard uncertainty | ute = transport stability standard uncertainty |

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 27, 2022

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

11.2 Lot Expiration Date

- January 27, 2027

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- 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

SD978Ci Paul R Saines



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

| Product Code: | Multi Analyte Custom Grade Solution | | |
|---------------------|--|--------------------|--|
| Catalog Number: | CLPP-CAL-3 | | |
| Lot Number: | T2-MEB714159 | | |
| Matrix: | 7% (v/v) HNO3 | | |
| Value / Analyte(s): | 1 000 μg/mL ea: Arsenic, Selenium, | Lead, Thallium, | |
| | 500 μg/mL ea: Cadmium | | |

3.0 CERTIFIED VALUES AND UNCERTAINTIES

| ANALYTE Arsenic, As | CERTIFIED VALUE 1 000 ± 8 µg/mL | ANALYTE Cadmium, Cd | CERTIFIED VALUE 500.0 ± 2.1 μg/mL |
|------------------------|------------------------------------|------------------------|--------------------------------------|
| Lead, Pb | 1 000 ± 5 μg/mL | Selenium, Se | 1 000 ± 8 μg/mL |
| Thallium, Tl | 1 000 ± 7 μg/mL | | |

Density:

1.043 g/mL (measured at 20 \pm 4 °C)

Assay Information:

| ANALYTE | METHOD | NIST SRM# | SRM LOT# |
|---------|-----------|-----------|----------|
| As | ICP Assay | 3103a | 100818 |
| Cd | ICP Assay | 3108 | 130116 |
| Cd | EDTA | 928 | 928 |
| Pb | ICP Assay | 3128 | 101026 |
| Pb | EDTA | 928 | 928 |
| Se | ICP Assay | 3149 | 100901 |
| ТІ | 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 | Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization |
|--|---|
| used is the weighted mean of the results: | is used is the mean of individual results: |
| $X_{CRM/RM} = \Sigma(w_i) (X_i)$ | X _{CRM/RM} = (X _a) (u _{char a}) |
| X _i = mean of Assay Method i with standard uncertainty u _{char i} | X _a = mean of Assay Method A with |
| w_i = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$ | u _{char} a = the standard uncertainty of characterization Method A |
| CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{1/2} | CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² char a + u ² bb + u ² lts + u ² ts) ¹ |
| k = coverage factor = 2 | k = coverage factor = 2 |
| $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}$ are the errors from each characterization method | u _{char a} = the errors from characterization |
| ubb = bottle to bottle homogeneity standard uncertainty | u _{bb} = bottle to bottle homogeneity standard uncertainty |
| u _{lts} = long term stability standard uncertainty (storage) | ults = long term stability standard uncertainty (storage) |
| u _{te} = transport stability standard uncertainty | ute = transport stability standard uncertainty |

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

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

11.2 Lot Expiration Date

- January 13, 2027

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- 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

SD978Ci Paul R Saines

Certificate of Analysis

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

INORGANIC" V E N T U R E S

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: Sodium, | Iron, | |
| | | 200 µg/mŁ ea: Magnesium, Cerium, Thallium, | Aluminum, Selenium, | |
| | | 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, Vanadium, | Boron, | |
| | | 20 μg/mL ea: Zinc, Barium, Cadmium, Manganese, | Strontium, Beryllium, Cobalt, Lithium, | |
| 3.0 | CERTIFIED VALUES | 7.5 µg/mL ea: Silver AND UNCERTAINTI | ES | |

| 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 | Cadmium, Cd | 20.00 ± 0.09 µg/mL |
| Calcium, Ca | 100.0 ± 0.4 μg/mL | Cerium, Ce | 200.0 ± 0.8 μg/mL |
| Chromium, Cr | 40.00 ± 0.30 μg/mL | Cobalt, Co | 20.00 ± 0.10 µg/mL |
| Copper, Cu | 30.00 ± 0.13 µg/mL | Iron, Fe | 300.0 ± 1.3 μg/mL |
| Lead, Pb | 100.0 ± 0.4 µg/mL | Lithium, Li | 20.00 ± 0.08 µg/mL |
| 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 | | |
| | | | |

Density:

1.034 g/mL (measured at 20 \pm 4 °C)

Assay Information:

| ANALYTE Ag | METHOD ICP Assay | NIST SRM# 3151 | SRM LOT# 160729 |
|---------------|--------------------------|--------------------|--------------------|
| Ag | Volhard | 999c | 999c |
| Ag | Calculated | | See Sec. 4.2 |
| A | ICP Assay | 3101a | 140903 |
| Al | EDTA | 928 | 928 |
| As | ICP Assay | 3103a | 100818 |
| В | ICP Assay | 3107 | 190605 |
| Ba | ICP Assay | 3104a | 140909 |
| Ва | Gravimetric | | See Sec. 4.2 |
| Be | ICP Assay | 3105a | 090514 |
| Са | ICP Assay | 3109a | 130213 |
| Са | EDTA | 928 | 928 |
| Cd | ICP Assay | 3108 | 130116 |
| Cd | EDTA | 928 | 928 |
| Се | ICP Assay | 3110 | 090504 |
| Ce | EDTA | 928 | 928 |
| Co | ICP Assay | 3113 | 190630 |
| Со | EDTA | 928 | 928 |
| Cr | ICP Assay | 3112a | 170630 |
| Cu | ICP Assay | 3114 | 121207 |
| Cu | EDTA | 928 | 928 |
| Fe | ICP Assay | 3126a | 140812 |
| Fe | EDTA | 928 | 928 |
| Hg | ICP Assay | 3133 | 160921 |
| Hg | EDTA | 928 | 928 |
| к | ICP Assay | 3141a | 140813 |
| к | 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 | 0400 | See Sec. 4.2 |
| Ni Ni | ICP Assay | 3136 | 120619 |
| P | EDTA | 928 3139a | 928 |
| P | ICP Assay Acidimetric | | 060717 |
| F Pb | ICP Assay | 84L 3128 | 84L |
| Pb | EDTA | 928 | 101026 928 |
| Se | ICP Assay | 3149 | 920 100901 |
| Sr | EDTA | 928 | 928 |
| Sr | ICP Assay | Traceable to 3153a | 920 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 |
| | Eco 4 | | |

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 | Characterization of CRM/RM by One Method |
|---|---|
| Certified Value, X _{CRMRM} , where two or more methods of characterization are used is the weighted mean of the results: | Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results: |
| $\begin{split} & X_{CRM/RM} \equiv \Sigma(w_i) \; (X_i) \\ & X_i = \text{mean of Assay Method i with standard uncertainty } u_{char, i} \\ & w_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & w_i = (1/u_{char, i})^2 / (\Sigma(1/(u_{char, i})^2)) \end{split}$ | $X_{CRM/RM} = (X_a) (u_{char a})$ $X_a = mean of Assay Method A withu_{char a} = the standard uncertainty of characterization Method A$ |
| CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k $(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{V_2}$ k = coverage factor = 2 $u_{char} = [\Sigma[(w_i)^2 (u_{char}_i)^2])^{V_2}$ where u_{char} is the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty $u_{lts} = long term stability standard uncertainty (storage) u_{te} = transport stability standard uncertainty$ | CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{chara} + u^2_{bb} + u^2_{tts} + u^2_{ts}$) ^{1/k} k = coverage factor = 2 u _{chara} = the errors from characterization u _{bb} = bottle to bottle homogeneity standard uncertainty u _{Its} = long term stability standard uncertainty (storage) u _{uts} = transport stability standard uncertainty |

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

4.0

- 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

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 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

SD9781.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Page 6 of 6

Certificate of Analysis

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

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1.0 ACCREDITATION / REGISTRATION

ÍNORGANÍ

VENTURES

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, SIO2 | 200.2 ± 1.3 μg/mL | Tin, Sn | 70.0 ± 0.4 µg/mL |
| Titanium, Ti | 20.01 ± 0.13 μg/mL | | |

Density:

1.025 g/mL (measured at 20 ± 4 °C)

Assay Information:

| ANALYTE Mo | METHOD ICP Assay | 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 |
| π | ICP Assay | 3162a | 130925 |
| ті | 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_{CRWRM}, 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 (±) = $U_{CRM/RM} \simeq k \left\{ u_{char}^2 + u_{bb}^2 + u_{ts}^2 + u_{ts}^2 \right\}^{\frac{1}{2}}$

k = coverage factor = 2

 $\begin{array}{l} u_{char} = [\overline{\Sigma}((w_{i})^{2} \, (u_{char})^{2})]^{2} \ \ \, \mbox{ where } u_{char} \ \, _{i} \mbox{ are the errors from each characterization method} \\ u_{bb} = bottle \ \, \mbox{ bottle homogeneity standard uncertainty} \\ u_{hs} = long \ \, \mbox{ term stability standard uncertainty (storage)} \end{array}$

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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:

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

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

 $\label{eq:coverage factor = 2} \\ u_{char} a = the errors from characterization \\ u_{bb} = bottle to bottle homogeneity standard uncertainty$ $u_{its} = long term stability standard uncertainty (storage)$ $u_{its} = transport stability standard uncertainty$

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ 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.

- Sealed TCT Bag Open Date:

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

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

3D978

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis

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

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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

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

Assay Information:

3.0

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 200.59 +2 4 Hg(OH)(aq) 1+ Chemical Compatibility - Stable in HNO3. Avoid basic media forming insoluble carbonate. The sulfide, basic carbonate, oxalate, phosphate, arsenite, arsenate and iodide are insoluble in water.

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 22, 2021

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

11.2 Lot Expiration Date

- September 22, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong Supervisor, Product Documentation

Ulya new

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine



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.
 - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of 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: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

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

Page 1 of 2

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



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



ICSA

M5126

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M5128

M5129

M5130

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. | "CERTIFIE | | | ERENCE CH | IECK SAMPL CSB-0710 | E ICP-AES IO | CSA-1211, |
|----------|-----------|------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
| 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) |
| AI | 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 |
| Са | 5000 | 245000 | 208000 | 282000 | 235000 | 199000 | 271000 |
| Cr | 10 | (52.0) | 42.0 | 62.0 | 542 | 460 | 624 |
| Со | 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.

| m/z-> | 1.0E6 | 2.0E6 | m/z-> | 1000 | 2000 | 1.0E5 | 2.0E5 | 1. Ammonium molybdate (Mo) | Compound | Volume show | NIST Tes | Recommended Storage: Nominal Concentration (µg/mL): | Expire | Part Lot Des | CERTIFIED WEIGHT REPORT: | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
|-------|-------|-------|-------|------|---------|-------|--------------------------------------|----------------------------|--|---|--------------------------|--|--------------------|--|--------------------------|--|
| 210 | | | 110 | | đ | | [1] Spectrum No.1 | | Nur | vn below was o | NIST Test Number: | d Storage: n (µg/mL): | Expiration Date: | Part Number: Lot Number: Description: | | s, Inc. |
| 2 | | | 120 | | N | | No.1 | 58142 022222 | Part Lot Number Number | Volume shown below was diluted to (mL): | 6UTB | Ambient (20 °C) 1000 | 051725 | 57042 051722 Molybde | | - |
| | | | | | | | [8.594 | 0.1000 | Dilution Factor | 3000.41 | | 20 °C) | | <u>57042</u> <u>051722</u> Molybdenum (Mo) | | |
| | | | 130 | | G | | sec]:5704 | 300.0 | Initial Un Vol. (mL) Pip | 0.058 Flas | 5E-05 Bala | | | | | M.S. |
| | | | 140 | | 40 0 | | 8.594 sec]:57042.D# [Count] [Linear] | 0.084 | Uncertainty N Pipette (mL) Conc | Flask Uncertainty | Balance Uncertainty | | | MKE | _ | Certified Rep M.5192 |
| | | | 150 | | 50 | | unt] [Líne | 1000 | Nominal Conc. (µg/mL) Co | | | | 0.5% | MKBQ8597V Am | Lot # | ference M. |
| | | | 160 | | 60 | |)ar] | 10001.0 | Initial Conc. (µg/mL) C | | | | 15.0 » (mL) | Ammonium hydroxide | | Certified Reference Material CRM いちいのえいたいのんりはてい |
| | | | 170 | | 70 | | | 1000.0 | Final Conc. (µg/mL) | Г | | | Ammonium hydroxide | æ | - | M 172 |
| | | | | | | | | 2.1 | Expanded Uncertainty +/- (µg/mL) | | Reviewed By: | N's | Formulated By: | A | | |
| | | | 180 | | 80 | | | 13106-76-8 | (Solve CAS# | | | to I | | deronce | | • |
| | | | 190 | | 90 | | | 5 mg(Mo)/m3 | SDS Information nt Safety Info. On Attac OSHA PEL (TWA) | | Pedro L. Rentas | era | Lawrence Barry | An | | nt 、 |
| | | | 200 | | 100 | | | 13 orl-rat 333 mg/kg | SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50 | | s 051722 | / | rry 051722 | Ψ | | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |
| | | | | | | | | kg 3134 | NIST | | 722 | | 722 | | | 4 Accredite ate Numbe ndards.com |

Part # 57042 Lot # 051722

1 of 2

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| vww.absc | 100-368-1 |
|---------------------------|------------|
| vww.absolutestandards.com | 0-368-1131 |
| com | rds, I |
| | Inc |



Certified Reference Material CRM



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

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

| | | | | | | | Trace M | letals | Verifica | ition | by ICP-N | IS (µ | g/mL) | | | | | | |
|----------|-------|----------|-------|-----|-------|-----|---------|--------|----------|-------|----------|-------|-------|----|-------|----|-------|-----|--|
| A | <0.02 | ß | 40.02 | Dv | 20.02 | Ηŕ | 3 | 1 | - | 1 | | | | | | | | | |
| SP SP | A).02 | Ĵ, | 2.0 | 7 5 | 10.02 | 1 | <0.02 | ' E | 20.02 | N | <0.02 | P | <0.02 | Se | <0.2 | 4L | <0.02 | W | <0.02 |
| <u>,</u> | | <u>م</u> | 10.2 | 5 | 20.02 | Ho | <0.02 | Lu | <0.02 | ß | <0.02 | Re | <0.02 | Si | 40.02 | 5 | <0.02 | 11 | 4000 |
| 2 | 202 | ŝ | 20.02 | E | <0.02 | h | <0.02 | Mg | <0.01 | ò | <007 | Rh | 50 | ۸, | 2003 | 3 | 3 | : (| |
| Ba | 40.02 | S | <0.02 | 2 | 300 | 7 | 3 | ξ, | 2 | 2 | | | 10.02 | 26 | 70.02 | | 20.02 | < | 20.02 |
| Be | 5 | ? | 3 | 2 | 20.02 | l = | 70.02 | UTAT | 20.02 | Pd | <0.02 | Rb | <0.02 | Na | 40.2 | Ъ | <0.02 | ΥЪ | <0.02 |
| 2 | - | 2 | 70.02 | Ca | <0.02 | He | <02 | Hg | 40.2 | P | <0.02 | Ru | <0.02 | S | 40.02 | J | 300 | < | 2003 |
| Id | 20.02 | 6 | 40.02 | ଜ | <0.02 | 5 | 40.02 | Mo | ÷ | ¥ | 2003 | ŝ | 202 | 0 | 5 | > | | 1, | 10104 |
| ω | 40.02 | 6 | <0.02 | An | 3 | ş | 3 | E | | ; ; | TO'NE | UH | 70.02 | 0 | 20.05 | Sn | 20.02 | 5 | <0.02 |
| | | | | | 10.01 | 0.1 | 20.05 | ING | 20.02 | ~ | 40.2 | Sc | <0.02 | Ta | <0.02 | Т | <0.02 | 72 | <0.02 |
| | | | | | | | | | | | | | | | | | | | And in the second secon |

(T)= Target analyte

Physical Characterization:

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

Son 1. S

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 57042 Lot # 051722



Certificate of Analysis

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

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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

Ti

| Product Code: | Multi Analyte Custom Grade Solution | on |
|---------------------|---|---------------------|
| Catalog Number: | CHEM-QC-4 | |
| Lot Number: | S2-MEB711674 | |
| Matrix: | 3% (v/v) HNO3 3% (v/v) HF | |
| Value / Analyte(s): | 1 000 μg/mL ea: Boron, Silicon, Titanium | Molybdenum, Tin, |

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ICP Assay

| ANALYTE Boron, B | CERTIFIED VALUE 1 000 ± 7 μg/mL | ANALYTE Molybdenum, Mo | CERTIFIED VALUE 1 000 ± 5 μg/mL | |
|---------------------|------------------------------------|---------------------------|------------------------------------|----------|
| Silicon, Si | 1 000 ± 7 μg/mL | Tin, Sn | 1 000 ± 5 μg/mL | |
| Titanium, Ti | 1 001 ± 6 μg/mL | | | |
| Density: | 1.032 g/mL (meas | sured at 20 ± 4 °C) | | |
| Assay Information | ו: | | | |
| ANALYTE | METHOD | NIST SRM# | | SRM LOT# |
| В | ICP Assay | 3107 | | 110830 |
| Мо | ICP Assay | 3134 | | 130418 |
| Si | ICP Assay | 3150 | | 130912 |
| Sn | ICP Assay | 3161a | | 140917 |

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.

3162a

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

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

11.2 Lot Expiration Date

- November 02, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



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.
 - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

Enclosed is a set of one (1) or more bottles of 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

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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: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

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

Page 1 of 2

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



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



ICSA

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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.

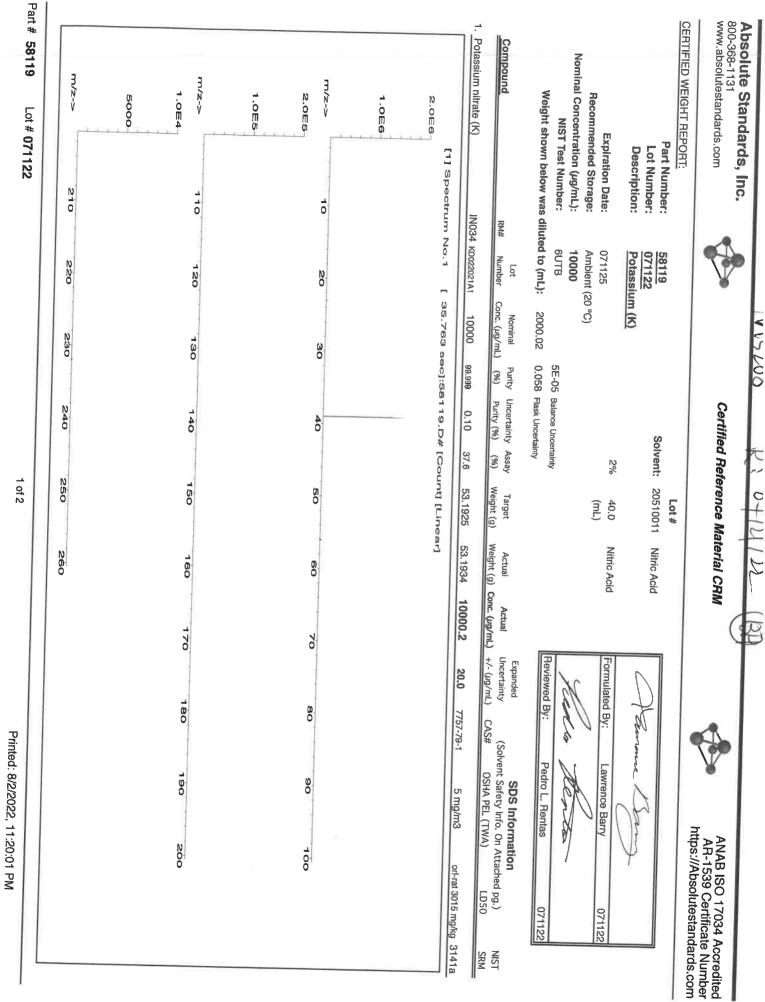
ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

(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. | "CERTIFIE | | | ERENCE CH | IECK SAMPL CSB-0710 | E ICP-AES IO | CSA-1211, |
|----------|-----------|------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
| 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) |
| AI | 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 |
| Са | 5000 | 245000 | 208000 | 282000 | 235000 | 199000 | 271000 |
| Cr | 10 | (52.0) | 42.0 | 62.0 | 542 | 460 | 624 |
| Со | 50 | (0.0) | -50.0 | 50.0 | 476 | 404 | 548 |
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| 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.



1 of 2

| 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 Indu | Mass Spec | | |
| <0.02 | Trace Metals V | | |
| 40.02 40.02 40.02 Ca 40.02 Ca | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | <0.2 | $\begin{array}{c c} W & < 0.02 \\ U & < 0.02 \\ V & < 0.02 \\ Y & < 0.02 \\ Y & < 0.02 \\ Z n & < 0.02 \\ \end{array}$ |
| Physical Characterization: | (T)= Target analyte | | 1 10.02 |
| Homogeneity: No heterogeneity was ob | Homogeneity: No heterogeneity was observed in the preparation of this standard. | Ce | Certified by: |
| | | () | sold and a |
| | 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 | ated. ed in | |
| Standards are prepared gravimetriculously cleaned prior to use. Standards are certifed (+/-) 0.5% of the stated value, unless All standards should be stored with caps tight and under apping the uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin Measurement Result," NIST Technical Note 1297, U.S. Govern | 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 1305 | | |
| | This is the second | | |
| | D.C. (1994). | | |



QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R : 以120 2 [

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

- APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.
 - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

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

> Safety Data Sheets Available Upon Request



(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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

RMs ICV 1, 5, 6 SFAM.docx

Page 1 of 2

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



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



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

AP11MInstructions for QATS Reference Material: Inorganic ICV SolutionsICV1-1014For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate
into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.ICV5-0415For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting
1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume
with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K2Cr2O7
and 5% (v/v) nitric acid.ICV6-0400For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6
concentrate into a 100 mL volumetric flask and dilute to volume with Type II water.
Distill this solution along with the samples before analysis. The cyanide concentrate
is prepared from K3Fe(CN)6, Type II water, and 0.1 % sodium hydroxide, and will
decompose rapidly if exposed to light.

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

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

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

| | ICV5-0415 | | ICV6-0400 |
|---------|---|-----------------|---|
| Element | Concentration (µg/L) (after 100-fold dilution) | Analyte | Concentration (µg/L) (after 100-fold dilution) |
| Hg | 4.0 | CN [.] | 99 |

| Ex Recomme Nominal Concentry Weight sho 2.0E6 m/z-> 2.0E5 1.0E5 5.0E5 2.5E6 | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT: Part Number: Lot Number: |
|--|--|
| Expiration Date: 072125 2% 40.0 Nitric Addi nanded Storage: Ambient (20 °C) fml) 5E-05 Baaroe Uncertainy fml) fml) ST Test Number: fml) SE-05 Baaroe Uncertainy fml) fml) SE-05 Baaroe Uncertainy SE-05 Baaroe Uncertainy fml) fml) SE-05 Baaroe Uncertainy SE-05 Baaroe Uncertainy Actual Number: fml) Winght (a) Winght (b) Wingh | Part Number: Lot Number: Description: |
| NIST Test Number: 6UTB 5E-D5 Bainone Uncertainty Nominal Purity Uncertainty Actual Barlum nitrate (Ba) IN023 N0022 0.0058 Fast Uncertainty Actual 1.0EE6 I11 Spectrum No.1 [112.514 see]:65156.0.# Country (N) (N) Weight (Q) 1.0EE6 I11 Spectrum No.1 [12.514 see]:65156.0.# Count [Linean] 2.0EE6 I10 20 30 40 sio eo 1.0EE6 I 10 20 30 40 sio eo 2.0EE5 10 20 30 40 sio eo sio sio< | Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): |
| Compound New Number Core: (ug/mk) (%) Pairty (%) (%) Weight (%) <td>Weight shown below was :</td> | Weight shown below was : |
| III Spectrum No.1 [12.514 sec]:58158.D# [Count] [Linear] III 10 20 30 40 50 III 10 120 190 140 150 III 120 190 140 150 III 120 190 140 150 III 120 190 140 150 | |
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| | 8 |
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| | ר. ס מ |
| N G H H H H H H H H H H H H H H H H H H | 0 |
| | N. 01 01 |
| | Part # 57056 Lot # 072122 |

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



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

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

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|--------|---|-----|-------|----|---------|----|-------|-------|-------|-----|-------|-----|-------|--------------|-------|----|-------|-------|--------------|
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| + . | - | 3 | 70'N2 | 3 | | 늭 | <0.02 | MN | <0.02 | Ъ | <0.02 | RЪ | <0.02 | Na | 40.2 | Ē | <0 UD | ۲'n | 0007 |
| 0.0 | | 1 | <0.02 | Ga | <0.02 | Че | <0.2 | Hg | <0.2 | ۵. | <0.02 | Ru | <0.02 | 2 | 007 | ł | | ; > | 1000 |
| 20.0> | | ,Q | <0.02 | e | <0.02 | La | <0.02 | Mo | <0.02 | å | 2007 | | | 5 0 | | | 70.02 | - | 20.02 |
| <0.02 | 1 | jă, | <0.02 | An | 000 | á | 2007 | PIN I | | : > | 20.00 | | 70.02 | 0 | 70'02 | 10 | <0.U2 | 70 | <0.02 |
| | 1 | | | m | TRA | 2 | 20.02 | DNT | ZUNZ | 2 | 202 | ŝ | <0.02 | Ta | <0.02 | i | 2002 | 7, | 2007 |

Physical Characterization:

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

Certified by:

ar R

- * 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).

Nitric Acid CMOS





M5402 M5403 M5404 M5405 M5406 M5407

Material No.: 9606-03 Batch No.: 22C0462001 Manufactured Date: 2022-02-11 Retest Date: 2027-02-10 Revision No.: 0

Certificate of Analysis

| Test | Specification | Result |
|-----------------------------------|---------------|-------------|
| Assay (HNO₃) | 69.0 - 70.0 % | 69.4 % |
| Appearance | Passes Test | Passes Test |
| Color (APHA) | ≤ 10 | 5 |
| Residue after Ignition | ≤ 2 ppm | < 1 ppm |
| Chloride (Cl) | ≤ 0.08 ppm | < 0.03 ppm |
| Phosphate (PO ₄) | ≤ 0.10 ppm | < 0.03 ppm |
| Sulfate (SO ₄) | ≤ 0.2 ppm | < 0.2 ppm |
| Trace Impurities - Aluminum (Al) | ≤ 40.0 ppb | < 1.0 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 2.0 ppb |
| Trace Impurities - Barium (Ba) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Beryllium (Be) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Bismuth (Bi) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Boron (B) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Cadmium (Cd) | ≤ 50 ppb | < 1 ppb |
| Trace Impurities - Calcium (Ca) | ≤ 50.0 ppb | 1.2 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 30.0 ppb | 1.7 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Copper (Cu) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Gallium (Ga) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Germanium (Ge) | ≤ 20 ppb | < 10 ppb |
| Trace Impurities - Gold (Au) | ≤ 20 ppb | < 5 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | < 50 ppb |
| Trace Impurities - Iron (Fe) | ≤ 40.0 ppb | < 1.0 ppb |
| Trace Impurities - Lead (Pb) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Lithium (Li) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Magnesium (Mg) | ≤ 20 ppb | < 1 ppb |
| Trace Impurities - Manganese (Mn) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Nickel (Ni) | ≤ 20.0 ppb | < 5.0 ppb |
| >>> Continued on page 2 >>> | | |

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC

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





Material No.: 9606-03 Batch No.: 22C0462001

| Test | Specification | Result |
|--|---------------|------------|
| Trace Impurities - Niobium (Nb) | ≤ 50.0 ppb | < 1.0 ppb |
| Trace Impurities - Potassium (K) | ≤ 50 ppb | < 10 ppb |
| Trace Impurities - Silicon (Si) | ≤ 50 ppb | < 10 ppb |
| Trace Impurities - Silver (Ag) | ≤ 20.0 ppb | < 1.0 ppb |
| Trace Impurities - Sodium (Na) | ≤ 150.0 ppb | < 5.0 ppb |
| Trace Impurities - Strontium (Sr) | ≤ 30.0 ppb | < 1.0 ppb |
| Trace Impurities - Tantalum (Ta) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Thallium (TI) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Tin (Sn) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Titanium (Ti) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Vanadium (V) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Zinc (Zn) | ≤ 20.0 ppb | < 1.0 ppb |
| Trace Impurities - Zirconium (Zr) | ≤ 10.0 ppb | < 1.0 ppb |
| Particle Count - 0.5 μm and greater | ≤ 60 par/ml | 7 par/ml |
| Particle Count - 1.0 µm and greater | ≤ 10 par/ml | 2 par/ml |
| | | |

>>> Continued on page 3 >>>

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700 Nitric Acid CMOS





Material No.: 9606-03 Batch No.: 22C0462001

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

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

James Techie Jamie Ethier Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700

Page 3 of 3

| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | Administration of the second s | (Solvent CAS# 0 7790-69-4 | | Printed: 1/18/2023, 4:01:43 PM |
|--|--|--|---|--------------------------------|
| ME | 3 | Actual Uncertainty. Conc. (ug/mL) +/- (ug/mL) 10000.4 20.0 | ۹ <u>۱</u> | |
| Material CI | Nitric Acid | Actual Weight (g) 100.0173 | | |
| Reference | 20510011 20.0 (mL) | Target Weight (g) 100.0134 | | 5 |
| Certified Reference Material CRW | Solvent: Solvent: 2% 5E-05 Balance Uncertainty 0.058 Flask Uncertainty | Uncertainty Assay Purity (%) (%) 0.10 10.0 | 240 240 240 240 240 240 240 240 240 240 | |
| N | 5E-05 0.058 | inal Purity ig/mL) (%) 00 89.899 | 9.619 sec]:58103. 30 130 24 14 4 | |
| | | Lot Nominal RM# Number Conc. (ug/mL) IN019 LIZ042018A1 10000 | 130 ²⁰ 1 | |
| Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | CERTIFIED WEIGHT REPORT: Part Number: 57103 Lot Number: 070622 Description: Lithium (070622 Recommended Storage: Ambient (Nominal Concentration (µg/mL): 10000 NIST Test Number: 6(JTB Weight shown below was diluted to (mL): | Compound R Lithium nitrate (Li) IN | 1.0E6 [1] Spectrum No.1 5.0E5 10 m/2-> 10 250 10 m/2-> 10 10 20 m/2-> 210 m/2-> 210 | |

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



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

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

| | | | | and the second se | | | | | | | and the second s | and the second se | and | | | | | | |
|----|-------|----|-------|---|-------|-----|-------|---------|-------|----|--|---|---|-----|-------------|--------|-------|-----|-------|
| - | <0.02 | B | <0.02 | Dy | <0.02 | Hf | <0.02 | E | T | ĪN | <0.02 | Ł | <0.02 | Se | ₫02 | 191 | <0.02 | M | 002 |
| Sb | <0.02 | రి | 40.2 | <u>لم</u> | <0.02 | Ho | <0.02 | La L | <0.02 | Ł | ≤0:0> | Re | <0.0> | 8 | <0.0> | e H | 40.02 | P | 4002 |
| 5 | ₫2 | ථ | <0.02 | 폡 | <0.02 | Ч | 0.02 | Mg | <0.01 | ő | <0.02 | Rh | <0.02 | Ag | <0.02 | F | <0.02 | > | 2002 |
| | <0.02 | ථ | <0.02 | 3 | <0.02 | 4 | 40.02 | Wa | <0.02 | Pd | <0.02 | Rb. | 40.02 | e N | 4 12 | É | 2002 | 5 | 1000 |
| e | <0.01 | 5 | 002 | පී | <0.02 | Ľ | <02 | He | <02 | ٩ | <0,00 | Ru | 89 | 3 | | Ę | | 2 > | |
| 2 | <0.02 | ථ | <0.02 | පී | <0.02 | el. | 40.02 | Ň | 20.0> | Å | 200 | , e | 200 | 5 0 | 200 | 13 | | | 70'02 |
| | <0.02 | õ | <0.02 | Au | <0.02 | £ | 0.02 | PN | <0.02 | ¥ | <02 | 3 | | Ē | | 3 F | | 5 4 | |

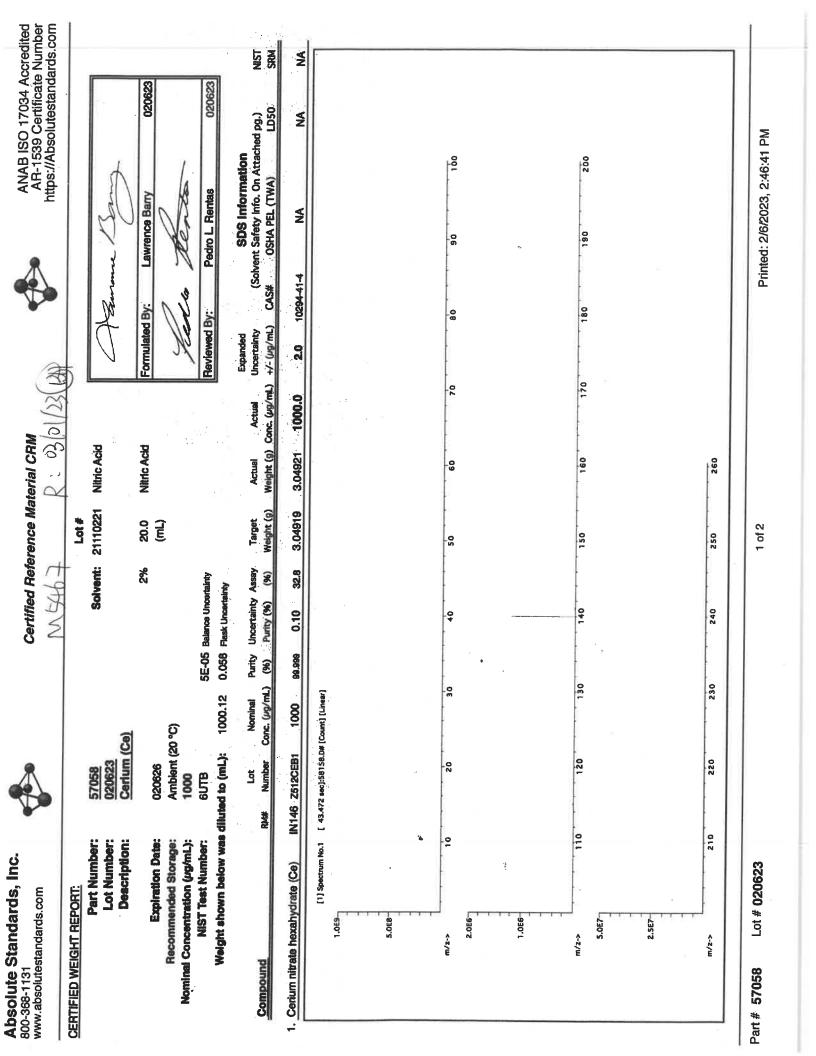
Physical Characterization:

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

Certified by:

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

Lot # 070622 Part # 57103



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



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

| | 42 Hr 488 W | | <0.02 Te <0.02 U | Ag <0.02 T1 <0.02 V <0.02 | <02 Th <0.02 Yb | <0.02 Tm <0.02 Y | <0.02 Sn <0.02 Zn | <0.02 Ti <0.02 Zr |
|------------------|-------------|-------|------------------|---------------------------|-----------------|------------------|-------------------|-------------------|
| (mL) | 002 | 70.05 | 20.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| igu, | đ | 1 | ž | Rh | Rb | Ru | Sm | ŝ |
| V ILP-MS | 00 | | 20.05 | <0.02 | <0.02 | <0.02 | <0.02 | <02 |
| | in in | | 2 | °S O | РД | <u>a</u> , | Ł | Х |
| ventication by I | 002 | 1000 | 70'02 | €0.01 | <0.02 | <02 | <0.02 | <0.02 |
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| | 000 | 20.0 | 20:02 | 4 0.2 | <0.02 | €0.01 | <0.02 | <0.02 |
| | AI | | 2 | As | Ba | Be | 盗 | P |

(T)= Target analyte

Physical Characterization:

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

Certified by:

Ser P

* 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).

| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | 031523 | on ttached pg.) NIST LD50 SRM ont-rat >2000mo/kg 3109a | Ő | O O N |
|--|--|---|---|--|
| ARA | Ped X Gio | SDS Information (Solvent Safety Info. On Attached pg.) CSHA PEL (TWA) LD5C C | -0 0 | 190 200 |
| MUXCITI | Formulated By: Reviewed By: | Expanded Uncertainty +/- (µg/mL) CAS: 20.0 471-34 | Q R | 170 |
| 170 | | Actual Actual Weight (g) Conc. (ug/mL) 75.2093 10001.4 | So | 1900 1900 1900 |
| Certified Reference Material CRM | Lot # Solvent: 21110221 2% 60.0 (mL) Uncertainty sentainty | Uncertainty Assay Target Purity (%) (%) Weight (g) 0.10 38.9 75.1990 | 0.D# [Count] [Line | 140 150 240 250 |
| NV5497 | 5E-05 Balance 00.41 0.058 Flask Un | Nominal Purity Uncertainty Conc. (<i>ug/m</i> L) (%) Purity (%) 10000 99.999 0.10 | 30 30 | - 30 5 7 30 7 30 7 30 |
| | 58120 031523 031526 031526 Ambient (20 10000 6UTB 6UTB 6UTB | Lot A RM# Number Con | 10 To 1 12 | 220 |
| Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | CERTIFIED WEIGHT REPORT: Part Number: 58120 Lot Number: 031523 Description: 031526 Expiration Date: 031526 Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL): | Compound 1. Calcium carbonate (Ca) | 2.0E4 1.0E4 3.0E4 5.0E4 2.5E4 | T.OES 1.0ES 5.0E4 m/2-> 2 m/2-> 2 Part # 58120 Lot # 031523 |

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

Certified Reference Material CRM



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

| | <0.02 | 3 | <0.02 | ĥ | <0.02 | Hf | <0.02 | Ц | <0.02 | z | <0.02 | Ł | <0.02 | ŝ | <0.2 | £ | <0.02 | × | <0.02 |
|---|--------------|----|--------------|----|--------------|----|-------|----|--------------|----|---------------|----|-------|----|-------|----|-------|---|-------|
| _ | <0.02 | లి | ٣ | 固 | 40.02 | Bo | 40.02 | 3 | <u>60.05</u> | ź | <0.02 | Se | <0.02 | ŝ | <0.02 | Te | <0.02 | Þ | 40.02 |
| | 40 12 | ථ | 40.02 | a | 40.02 | h | <0.02 | Mg | ±0.01 | ő | <u>60</u> .02 | 2 | <0.02 | Ag | <0.02 | F | <0.02 | > | <0.02 |
| _ | €0.05 | ඊ | <0.02 | 3 | 40.02 | 놰 | <0.02 | Å | €0.02 | æ | <0.02 | å | <0.02 | Na | <0.2 | Ę | <0.02 | ይ | 40.02 |
| | <0.01 | q | <0.02 | g | 40.02 | Ę | 402 | Hg | <0.2 | ۵. | <0.02 | Ru | <0.02 | S | €0.02 | Ę | <0.02 | × | <0.02 |
| | ≤0.02 | გ | <u>60.02</u> | ප් | 40.02 | 3 | 0.02 | Mo | <0.02 | æ | <0.02 | Sn | <0.02 | S | <0.02 | Sn | <0.02 | Ŋ | <0.02 |
| | ≤0.02 | ð | <u>60.05</u> | Au | 000 | £ | <0.02 | PN | <u>40.02</u> | Å | 40.2 | Sc | <0.02 | T. | ≤0.02 | Ę | <0.02 | Ň | 2002 |

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.

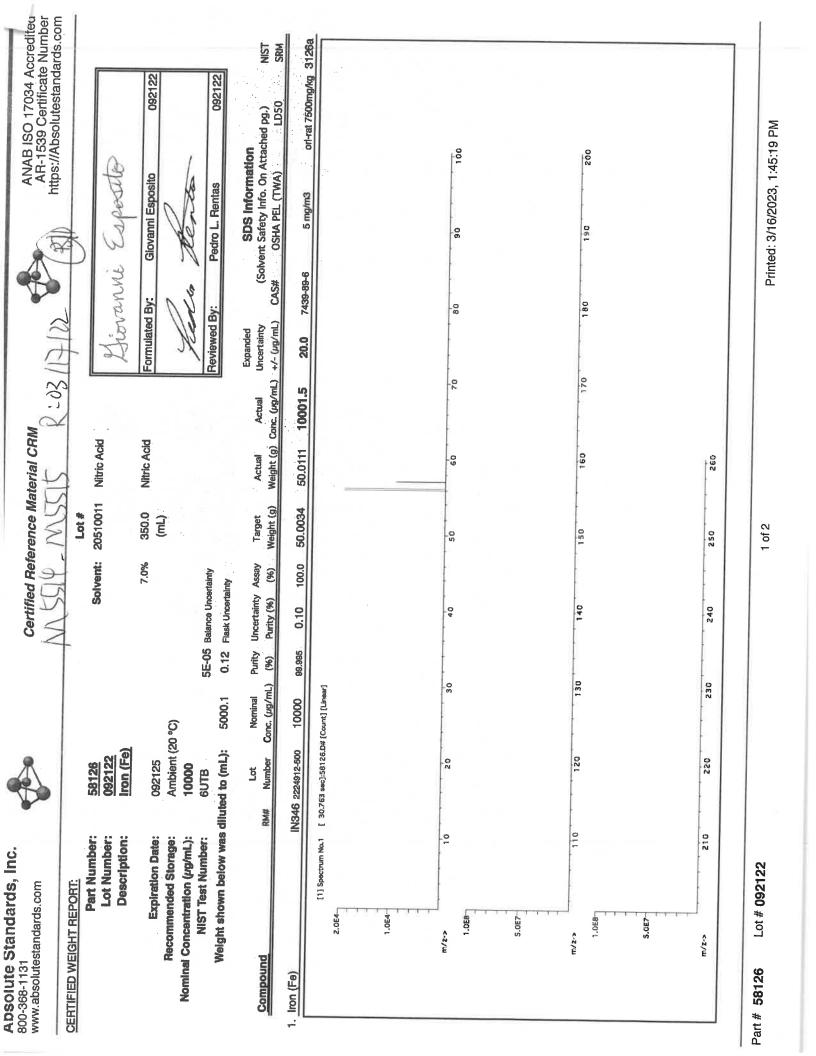
Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

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

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

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

Part # 58120 Lot # 031523



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

Certified Reference Material CRM



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

| E | <0.02 | G | <0.02 | Ŋ | <0.02 | Hf | <0.02 | п | <0.02 | ÿ | <0.10 | 놊 | <0.02 | Se | 40.2 | 4 | <0.02 | M | <0.02 |
|----|--------------|----|-------|----|-------|----|-----------|----|--------------|-----|--------------|----|-------|----|-------|----|-------|---------|-------|
| _ | <0.02 | ථ | 40.2 | 斑 | 40:02 | Но | 40.02 | 3 | 40.02 | ĝ | <0.02 | Re | <0.02 | ន | <0.02 | Ъ. | €0.05 | D | <0.02 |
| As | Ø2 | ථ | <0.02 | a | <0.02 | a | <0.02 | Mg | €0,01 | ő | €0.02 | Rh | ≤0.02 | Ag | 40.02 | F | <0.0> | > | <0.02 |
| _ | ≤0.02 | ඊ | 40.02 | 3 | ≤0:02 | н | 60 102 | Mn | <0.10 | R | <u>60.02</u> | Rb | ≤0.02 | R | 40.2 | f | <0.02 | ۹۶ ۲ | ≤0.02 |
| | 40.01 | Ċ | <0.05 | 3 | <0.02 | Ъ. | 402 | Hg | <02 | الم | <0.02 | Ru | <0.02 | S. | <0.02 | Ę | 40.02 | ۲ | ≤0.02 |
| _ | 40.02 | රී | <0.10 | පී | 0.10 | La | <0.02 | Mo | <u>40.02</u> | æ | <0.02 | Sm | <0.02 | s | <0.02 | Sn | <0.02 | Z | <0.05 |
| | <0.02 | 8 | <0.10 | Au | <0.02 | £ | <0.02 | PN | 20.02 | M | 402 | 3 | 40.02 | f | <0.02 | F | <0.02 | 77 | <000× |

Physical Characterization:

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

Certified by:

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

All standard containers are meticulously cleaned prior to use.

Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are 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 # 092122 Part # 58126

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

Part # 58024 Lot # 060523

1 of 2

Printed: 8/24/2023, 4:18:27 PM

| Absolute Standards, Inc. Certified Reference 800-368-1131 Image: Certified Reference www.absolutestandards.com Image: Certified Reference Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | andards.cor | s by Indu | ictive | y Coupled | Plasn | na Mass S | Spectr C | Certified Reference Material Ci | ICP-M | IS): | ateria | I CRM | | | | | ¥ | 크 | ANAB AR-11 ttps:/// | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | 034 Acc lificate N standar | lumbe ds.corr |
|--|---|--|--|---|---|---|--|---|---|---|---|--|---|-------------------------------------|----------------|--------|------------|---------------|---------------------------|--|----------------------------------|------------------|
| the stype of the style | | | | | | Trace N | Metals | s Verification | ation | হ | ICP-MS | | /g/mL) | | | | | | | | | |
| AI <0.02 | | 40,02 | Dv | 40.02 | H | <0.02 | E | 40.02 | - N | - - | 20 | | A) 02 | 8 | a) | - | - | | | 3 | | |
| | | 40.02 | Er Dy | <0.02 | Ho | <0.02 | 달드 | 4)02 4)02 | N N | A0.02 | 88 | ~ 7 | 40.02 0.02 | <u>8</u> % | 40.02 00.02 | ਜ ਸ | 4 4 | c ¥ | | <0.02 | | |
| | _ | <0.02 | 말 | <0.02 | 5 | <0.02 | Mg | <0.01 | ² 0 | <0.02 | .02 | Rh | 40.02 | Ag | <0.02 | 1 | <0.02 | | | <0.02 | | |
| Ba 40.02 | ନ ଜ | -T -T | ନ୍ଦ୍ର ହ | A 0.02 | ₹ ¹ ==" | 4. 6. B | H. Ma | A. A. | p Pd | A A 3 3 | 38 | 장 | A A 3 3 | ç N | A A 1 | 13 | A.2 | 4 15 | | 0.02 0 | | |
| | | 40.02 | 2 ଜ ା | 40.02 | 363 | 4 4 A | N M ; | 8 8 8 | × 77 · | A 40 12 | រ ន រ | Sc Sm | 40.02 2002 | Ta s | 4 4 A A | 11 S 🔒 | | | | | | |
| | | | | | | | | (T)= | (T)= Target analyte | anatyte | | | | | | | | | | | | |
| Physical Characterization: | aracteriz | ation: | | | | | | | | | | | | | | | C | Certified by: | by: | | a | |
| Homogeneity: No heterogeneity was observed in the preparation of this standard. | No heteroge | meity was o | observe | d in the preps | aration (| of this stand | lard. | | | | | | | | | | 1 | 14 | 1 | | ľ | |
| * 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 certified (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | ad value is ds, 18.2 n ation of all are prepar are prepar are certife ds should ds should ent Result. | he conc megohm d Ill standarc are me ars are me are are are me ars are me ars are me ars are me ars are me ars are me are are are me are are are me are | entrat leioniz ls. sticulou etrica .5% of .5% of .5 | ed water, c ed water, c usly cleane ully using ba f the state f the state f the state and Kuyat, a Note 122 | ted fro calibrat d prior alanced d value and un and un 97, U.S | red Class, ted Class, that are that are that are der appro Guideline Guideline | A glass A glass calibra priate s for E nent P | nd volume sware and ited with ites stated laborator, ivaluating vinting Off | the hi weight cond y cond fice, W | ighest p ighest p is trace itions. xpressir /ashingt | ments ourity able tr able the ton, D. | unless raw m raw m NIST 0 NIST 0. C. (19 | materials are used in Materials are used in ST (see above). ertainty of NIST 1994). | se stat re usec vve). NIST | n . | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

Part # 58024 Lot # 060523

| Absolute Standards, Inc. 800-368-1131 | цс. | | | | ertified F | leference | Certified Reference Material CRM | N/F | | | AF | ANAB ISO 17034 Accredited AR-1539 Certificate Number | Accredited te Number |
|--|----------------------------------|---|--------------------|----------------------|---|--------------------------|----------------------------------|------------------------|--|----------------------|---|--|-------------------------|
| www.absolutestandards.com | | | | | MSU | M5697 | R : 10 | 10/23/23 | | | https | https://Absolutestandards.com | dards.com |
| CERTIFIED WEIGHT REPORT: Part Number: Lot Number: | mber: mber: | 58029 102523 | | | | Lot # 24002546 | Solvent: Nitric Acid | | 10° | | 11 | | |
| Expiration Date: Recommended Storage: | piration Date: rded Storage: | CODDET (CU) 102526 Ambient (20 °C) | Cul | | | 2.0% | 40.0 (mL) | Nitric Acid | Formulated By: | Bel | Benson Chan | 102523 | 0 |
| Nominal Concentration (Jg/mL): 1000 NIST Test Number: 6UTB Volume shown below was diluted to (mL): | ig/mL): Imber: elow was di | 1000 6UTB liuted to (mL): | 2000.02 | 5E-05 0.058 | Balance Uncertainty Flask Uncertainty | Binty V | | | Reviewed By: | | Pedro L. Rentas | 102523 | |
| Compound | Part Number | t Lot ber Number | | Initial Vol. (mL) | Initial Uncertainty Vol. (mL) Pipette (mL) | Nominal Conc. (µg/mL) | Initial Conc. (µg/mL) | Final Conc. (µg/mL) | Expanded Uncertainty +/- (µg/mL) | Solvent S CAS# OS | SDS Information nt Safety Info. On Attac OSHA PEL (TWA) | SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50 | NIST SRM |
| 1. Copper(II) nitrate trihydrate (Cu) | 58129 | 29 100223 | 0.1000 | 200.0 | | 1000 | 10000.1 | | | 10031-43-3 | 1 mg/m3 | orl-rat 794 mg/kg | 3114 |
| [1] S 1.0E6 | [1] Spectrum No.1 | No.1 | 33.422 sec]:58029. |]:580 | 29.D# [(| D# [Count] [Linear] | inear] | | | | | | |
| 5.0E5 | | | | | | | | | | | | | |
| m/z-> 5.0E7 | 6 | O N | 0 R | 21 82 | 40 | 20 | O B | Q | ŝ | | 0 | 00 | |
| 2.5E7 | | | | | | | | | | | | | |
| Π/Z-> 2.0E7 | 0 | 120 | 130 | <u> </u> | 140 | 150 | 097 | 170 | 081 | | 190 | 200 | |
| 1.0€7 | | | | | | | | | | | | | |
| <-2/m | ۵10 0 | 550 | 530 | | 240 | 250 | 580 | | | | | | |
| Part # 58029 Lot # 102523 | g | | | | | 1 of 2 | | | | Printed: 1 | Printed: 10/26/2023, 1:20:31 PM | 1:20:31 PM | |

Absolute Standards, Inc. www.absolutestandards.com 300-368-1131



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



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|---|-------|----|-------|----|-------|----|--|--|------------|--------------------------|-------|----|--------|----------|-------|------|-------|-----|-------|
| | <0.02 | 3 | <0.02 | Dy | <0.02 | Hf | ≤0.02 | п | <0.02 | īŻ | <0.02 | Ł | <0.02 | 3 | <0.2 | 2 | 40.02 | M | <00> |
| _ | 6.02 | ű | <02 | ц | <0.02 | Ho | <0.02 | Ē | <0.02 | £ | <0.02 | Re | <0.02 | S | <0.02 | Ţe | <0.02 | Ð | <0.02 |
| _ | 402 | ല് | <0.02 | 岛 | <0.02 | ц, | 40.02 | Mg | 10.0> | ő | <0.02 | Rh | <0.02 | Ag | <0.02 | F | <0.02 | > | 2002 |
| _ | <0.02 | ඊ | <0.02 | 3 | ≤0.02 | 4 | <0.02 | Мп | <0.02 | Pd | <0.02 | Rb | \$0.02 | Na Na | <0.2 | Ê | <0.02 | Ś | 2002 |
| _ | <0.01 | ප් | <0.02 | g | <0.02 | Ł | <0.2 | Нg | <02 | 4 | <0.02 | Ru | <0.02 | š | 20 D2 | Ę | 80 | ; > | 200 |
| _ | <0.02 | ර | <0.02 | ප් | <0.02 | La | <0.02 | Mo | <0.02 | £ | <0.02 | Sm | 20.02 | | 2002 | 9 | | 1 | |
| | <0.02 | õ | F | Au | <0.02 | £ | <0.02 | PN | <0.02 | × | €02 | 8 | 0.02 | Ē | 2002 | 3 12 | | 38 | |

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

All standard containers are meticulously cleaned prior to use.

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

Standards are certifed ($\frac{1}{4}$ /-) 0.5% of the stated value, unless otherwise stated.

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

| Absolute Standards, Inc. 800-368-1131 | ds, Inc. | ¢ | | Č | rtified Re | ference M | Certified Reference Material CRM | 5 | | | AP | ANAB ISO 17034 Accredited AR-1539 Certificate Number | Accredited ate Number |
|--|---|--|--------------------|-----------|--------------------------|---------------------|----------------------------------|---------------|-------------------------|------------|---|---|--------------------------|
| www.absolutestartaata | | | | MS | 5698 | de la | 10/23 | 23 | | 6 | http: | https://Absolutestandards.com | ndards.com |
| CERTIFIED WEIGHT REPORT: | EI. | | | | | Lot # | Solvent: | | | | | | |
| | Part Number: Lot Number: Description: | <u>58025</u> 102623 Menrenece (Mn) | (Min) | | | 24002546 | Nitric Acid | | M. | Core C | | | |
| | ······ | | 11111 20 | | | 2.0% | 60.0 | Nitric Acid | Formulated Bv: | | Benson Chan | 102623 | 33 |
| ш | Expiration Date: | 102626 | | | | | (mL) | | 8 | | 0 | | 1 |
| Recommended Storage: | Recommended Storage: | Ambient (20 °C) | 0 °C) | | | | | | H | to B | ento | 1 | |
| | VIST Test Number: | GUTB | | 5E-05 B | Balance Uncertainty | inty | | | Reviewed By: | | Pedro L. Rentas | 102623 | 23 |
| Volume | Volume shown below was diluted to (mL): | s diluted to (mL): | 3000.41 | 0.058 F | Flask Uncertainty | ٨ | | ų | | | | | 1 |
| | | Part Lot | Dilution | Initial | Uncertainty | Nominal | Initial | Final | Expanded Uncertainty | (Solven | SDS Information (Solvent Safety info. On Attached pg.) | ation n Attached pg.) | NIST |
| Compound | Z | Number Number | Factor | Vol. (mL) | Vol. (mL) Pipette (mL) (| Conc. (vg/mL) | Conc. (ug/mL) | Conc. (µg/mL) | +/- (//Jm/) | CAS# (| OSHA PEL (TWA) |) LD50 | SRM |
| 1. Manganese(II) nitrate tetrahydrate (Mn) | | 58125 071123 | 0.1000 | 300.0 | 0.084 | 1000 | 10000.1 | 1000.0 | 2.1 2 | 20694-39-7 | 5 mg/m3 | ort-rat >300mg/kg | g 3132 |
| | [1] Spectrum No.1 | - | 34.243 sec]:57025. | c]:5702 | | D# [Count] [Linear] | ear] | | | | | | |
| 9.0E9 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 2.2 2 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| ~->/w | 0 | 20 | 30 | | 40 | 0 | 00 | 20 | 8 | | 08 | 100 | |
| 1,0E8 | | | | | | | | | | | | | |
| 5.0E7 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| ×-×/E | 110 | 120 | 130 | | 140 | 150 | 160 | 170 | 180 | | 180 | 200 | |
| 0.7 | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |
| <-z/ш | 210 | 550 | 230 | | 240 | 250 | 560 | | | | | | |
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| Part # 58025 Lot # | Lot # 102623 | | | | | 1 of 2 | | | | Printed: | Printed: 10/26/2023, 1:20:32 PM | 1:20:32 PM | |

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Certified Reference Material CRM



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

| | | Caller A. | AND THE REAL PROPERTY. | Contraction of the local distance of the loc | ロンコンになってもころに | The second second | The second secon | All and the second | Salar Salar Salar Salar | STATE AND A | No. of Concession, Name | The subscription of the su | | | | | | | |
|----------|-------|-----------|------------------------|--|--------------|-------------------|--|--------------------|-------------------------|-------------|-------------------------|--|-------|----------|-------|----|--------------|-----|--------------|
| - | <0.02 | 2 | <0.02 | Å | <0.02 | Hf | <0.02 | Li | 40.02 | ï | <0.02 | Ł | <0.02 | 8 | ≪0.2 | 4L | 40.02 | M | <0.02 |
| Sb | ≤0.02 | บ็ | 40.2 | 西 | <0.02 | Ho | <0.02 | 1 | ≤0.02 | ą | <0.02 | Re | <0.02 | Si | <0.02 | ę | 40.02 | . 5 | <0.02 |
| S | 40.2 | రి | <0.02 | ឝ | <0.02 | ų | <0.02 | Mg | 0.01 | ő | <0.02 | Rh | <0.02 | Ag | <0.02 | F | ≤0.02 | > | <0.02 |
| es es | <0.02 | ű | <0.02 | 3 | <0.02 | Ц | <0.02 | Wn | Ŀ | Pd | <0.02 | Rb | <0.02 | Na BR | 402 | Ē | <0.02 | ę, | 20.02 |
| Ð | 10.0> | ප් | <0.02 | Ga | <0.02 | Fe | <0.2 | Hg | <0.2 | ۵, | <0.02 | Ru | <0.02 | Sr. | <0.02 | Ta | <0.02 | > | <002 |
| ÷ | <0.02 | ර | <0.02 | පී | <0.02 | Ľa | <0.02 | Mo | <u>40.05</u> | £. | <0.02 | Sm | <0.02 | ŝ | ≤0.02 | Sn | <0.02 | Zu | 20.0> |
| ~ | ≤0.02 | õ | <0.02 | Au | 40.02 | q | <0.02 | PN | <0.0> | × | <0.2 | Sc | <0.02 | ea H | 0.02 | F | 0 .02 | 72 | 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

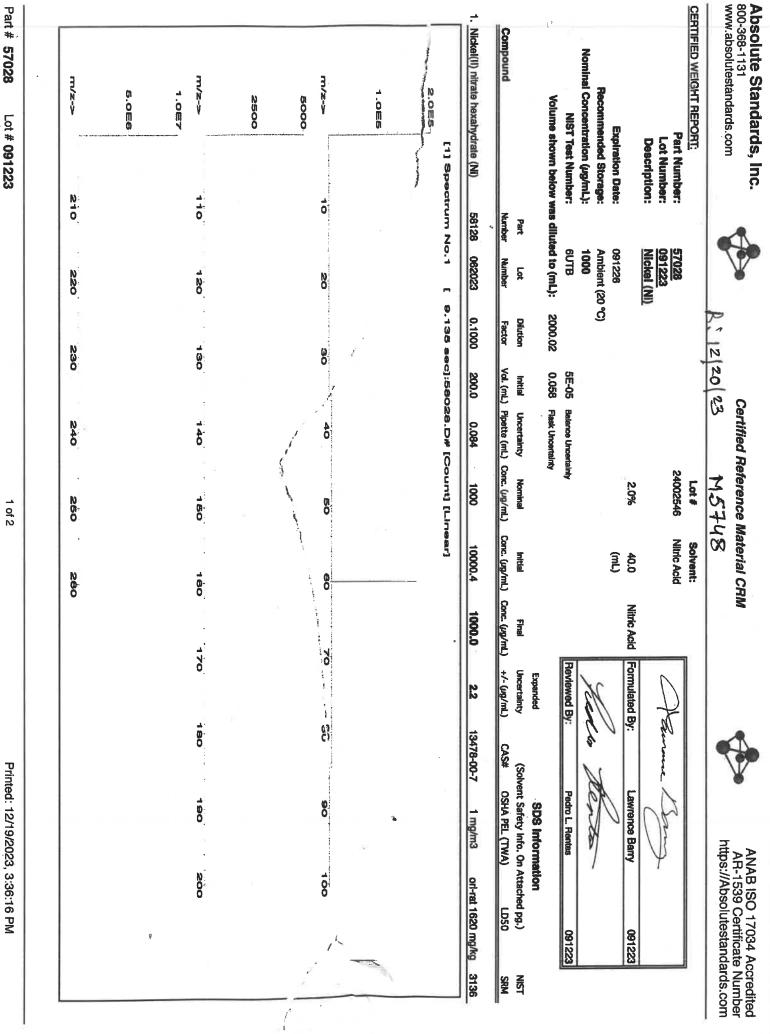
the balances that are calibrated with weights traceable to NIST (see above).

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

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

| m/z-> | | 2.0E6 | m/z-> | 0.0 П 14 | 1.0E5 | m/z-> | 0, 0 11 12 12 12 12 12 12 12 12 12 12 12 12 | 1.005 | 1. Lead(II) nitrate (Pb) | Compound | Weight sho | NIST 1 | Recommended Storage: Nominal Concentration (µg/mL): | Exc | | CERTIFIED WEIGHT REPORT: | ADSOIUTE Standards, Inc. 800-368-1131 www.absolutestandards.com |
|---------------------|--|-------|-------------|----------------|-------|----------|---|---------------------------------------|------------------------------|---|--------------------------------|------------------------------|--|-------------------------------|--|--------------------------|--|
| 21 0 220 0 | | | 110 120 | | | 10 20 | | [1] Spectrum No.1 [14 | IN029 PBD122016A1 | Lot M RM# Number Conc | s diluted to (mL): | NIST Test Number: 6UTB | | Expiration Date: 100926 | Lot Number: 100923 Description: Lead (Pb) | | om |
| 230 | | | 130 140 | | | 30 40 | | 14.144 sec]:58082.D# [Count] [Linear] | 1000 93.999 0.10 62.5 | Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) V | 3000.41 0.06 Flask Uncertainty | 5E-05 Balance Uncertainty | | 2% | | | Certified Referenc |
| 250 260 | | | 150 160 170 | | | 50 60 70 | | tj [Linear] | 4.80071 4.80077 1000.0 | Target Actual Actual Weight (g) Weight (g) Conc. (µg/mL) | | | (111) | 60.0 Nitric Acid | 46 NITHC ACID | | Certified Reference Material CRM こして、20123 Mらそれチ |
| | | | 0 180 190 | | | 80 00 | | | 2.0 10099-74-8 0.05 mg/m3 | Expanded SDS Informa Uncertainty (Solvent Safety Info. On +/- (µg/mL) CAS# OSHA PEL (TWA) | | Reviewed By: Pedro L. Rentas | Kerten Hen | Formulated By: Lawrence Barry | Admine By | | * |
| | | | 2000 | | | 100 | | | m3 intrvns-rat 83 mg/kg 3128 | SDS Information (Solvent Safety Info. On Attached pg.) NIST # OSHA PEL (TWA) LD50 SRM | | tas 100923 | Ø | ny 100923 | \¥ | | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |

| | DELL-10205000 | | | | | 2 of 2 | | | | | | | 00923 | Lot # 100923 | | Part # 57082 |
|---|--|---|--|------------------------------------|---|--|---|--|---|---|--|--|--|--|--|--|
| | | are used in ove). NIST | 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 standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | ity raw the to Ni the Unc. (| The certified value is the concentration calculated from gravimetric and volumetric measurements Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity 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 t 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 Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D | netric d the d. g and I g ffice, V | and volur assware ar vrated with wise state te laborate Printing C Printing C | s A gli re califi ropria nes foi nment | or to use. S. Gover S. Gover | ated f calibr valance t and c t, C.E. 297, U | tion calcu ed water usly clear ally using f the stat and Kuya al Note 1; al Note 1; | sentrat deioniz deioniz deioniz deioniz echnic c, B.N. h S.% o c, B.N. h i. S.% o c, B.N.h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h h h h h h h h h h h h h h h h h | The certified value is the concentration calculated from gravimetric and volume Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with w Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating a Measurement Result," NIST Technical Note 1297, U.S. Government Printing Offi | value i ion of a contain e prepa e certif keferen t Result t Result | certified preparat landard a dards ar dards ar tandards tandards suremen suremen | * The * Purifi * Stan * Stan Mea |
| P. S. | for the second s | | | | | | | ındard. | 1 of this sta | paratio | xd in the pre | observe | Homogeneity: No heterogeneity was observed in the preparation of this standard. | o heterog | encity: N | Homog |
| Certified by: | S | | | | Vte | get anal | (T)= Target analyte | | | | | | zation: | racteri | Physical Characterization: | Physi |
| W 40.02 V 40.02 Yb 40.02 Yb 40.02 Zn 40.02 Zn 40.02 Zn 40.02 Zn 40.02 | Ть Алл 11 Алл | e 40.2 g 40.02 a 40.02 a 40.02 a 40.02 a 40.02 a 40.02 a 40.02 | 40.02 Se 40.02 Si 40.02 Ag 40.02 Ag 40.02 Na 40.02 Na 40.02 Si | Rb Sm Sm | 40.02 40.02 40.02 40.02 40.02 | P P R P | 40.02 40.02 40.02 40.02 40.02 | Hg Mg | - 40.02 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 | 요 한 않 날 막 発 표 | 40.020 | ~ Co Co Co 또 편 것 | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | 5 | 40.02 40.02 40.02 40.02 40.02 | Al Sb Ba Bi Bi |
| | | | (µg/mL) | | by ICP-MS | | Verification | Metals | Trace M | | | | | | | |
| | | | | | MS): | (ICP- | trometry | s Spe | sma Mas | ed Pla | ly Couple | uctive | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | Analy | umental | Instru |
| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | | | | CRM | Certified Reference Material C | erenc | tified Re | Ce | | | | | s, Inc. | ards.co | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | w.absol |



| Part # 57028 Lot # 091223 2 of 2 | | * Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | Homogeneity: No heterogeneity was observed in the preparation of this standard. | (T) = Target aria/te | AI A02 Cd A02 Dy A02 H A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N A02 N <t< th=""><th>Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL)</th><th>www.absolutestandards.com</th></t<> | Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL) | www.absolutestandards.com |
|----------------------------------|-------|---|---|----------------------|---|--|---|
| | | | et . | 2 | Tb 40.02 Te 40.02 TI 40.02 Th 40.02 Sn 40.02 Ti 40.02 | | |
| | 5 | | P. S. | Certified by: | W -0.02 U -0.02 V -0.02 Yb -0.02 Yb -0.02 Yb -0.02 Zn -0.02 Zr -0.02 Zr -0.02 | | AR-1539 Certificate Number https://Absolutestandards.com |

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Z 01 Z

| Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | M | M5768 [M5769 (64) Certified Reference Material | ce Material CRM | 42/s | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |
|--|---|---|---|--|---|
| CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: | <u>58112</u> 091823 Magneslum (Mg) | Solvent: 24 | Lot # 24002546 Nitric Acid | Advenue | Or - |
| Expiration Date: 091826 Recommended Storage: Ambient (Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL): | 20 °C) | | (mL) (mL) (BF) $R - \frac{1}{3}/2\phi$ | Formulated By: Heviewed By: | Lawrence Barry 091823 Pedro L. Rentas 091823 |
| Compound | Lot Nominal I RM# Number Conc. (µg/mL) | Purity Uncertainty Assay T (%) Purity (%) (%) We | Target Actual Actual Weight (g) Weight (g) Conc. (vg/mL) | Expanded Uncertainty +/- (µg/mL) CAS | SDS Information (Solvent Safety Info. On Attached pg.) NIST # OSHA PEL (TWA) LDSO SRM |
| 1. Magnesium nitrate hexahydrate (Mg) IN030 маюзаал | 10000 | 99.999 0.10 8.51 23 | | 20.0 13446-1 | ng/kg 3 |
| [1] Spectrum No.1 1.0E6 | | [19.923 sec]:58112.D# [Count] [Linear] | [Linear] | | |
| 5. 0 M 6 7 | | | | | |
| m/z-> 10 | 20 | 8 | ø | 70 80 | 90 100 |
| 1000 - | | · | | 4 | |
| ₩/z-> | 120 130 | 140 | 150 160 | 170 180 1 | 190 |
| 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 | | | | | |
| Part # 58112 Lot # 091823 | | - | 1 of 2 | Drintod | Drintod- 10/00/0000 0.56-15 DM |

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| /ww.absolutestandards.com | 00-368-1131 | Absolute Standards, I |
|---------------------------|-------------|-----------------------|
| | | Inc |



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

| Γ | | | | | | | Trace Mo | etals | Verifica | tion | by ICP-N | IS (µ | g/mL) | | | | | | |
|----------|-------|---|--------------|----|-------|----|----------|-------|------------------|------|----------|-------|-------|-----|-------------------|-----|-------|----|-------|
| | | | | | | | | | 1100 100 100 100 | | | | | 100 | The second second | | | | |
| A | <0.02 | 8 | <0.02 | Dy | <0.02 | Hf | <0.02 | 5 | <0.02 | N | <0.02 | Ŗ | <0.02 | Se | 40.2 | qI. | <0.02 | W | <0.02 |
| SP | <0.02 | G | <0.2 | E. | <0.02 | Но | <0.02 | Lu | <0.02 | Nb | <0.02 | Re | <0.02 | ŝ | <0.02 | Te | <0.02 | d | <0.02 |
| As | <0.2 | ĉ | <0.02 | E | <0.02 | In | <0.02 | Mg |] | SO | <0.02 | Rh | <0.02 | Ag | <0.02 | H | <0.02 | V | 40.02 |
| Ba | <0.02 | S | <0.02 | ନୁ | <0.02 | F | <0.02 | Mn | <0.02 | Pd | <0.02 | Rb | <0.02 | Na | <0.2 | Ъ | <0.02 | Υb | <0.02 |
| Ве | <0.01 | Ŷ | <0.02 | Ga | <0.02 | Fe | 40.2 | Hg | <0.2 | ٩ | <0.02 | Ru | <0.02 | Sr | <0.02 | Tm | <0.02 | ĸ | <0.02 |
| B | <0.02 | S | <0.02 | Ģ | <0.02 | La | <0.02 | Mo | <0.02 | Ŗ | <0.02 | Sm | <0.02 | ŝ | <0.02 | Sn | <0.02 | 6 | <0.02 |
| 5 | 40.02 | ç | 40.02 | Au | <0.02 | P | <0.02 | Nd | <0.02 | ĸ | <0.2 | S. | <0.02 | Ta | <0.02 | Ti | <0.02 | Zr | <0.02 |

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 58112 Lot # 091823



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

Physical Characterization:

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

Certified by:

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

- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
 - All standard containers are meticulously cleaned prior to use.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 - Standards are certifed ($\frac{1}{4}$) 0.5% of the stated value, unless otherwise stated.
- All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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

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

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

Part # 57050 Lot # 071123

2 of 2

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

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

Certified Reference Material CRM



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

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

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

Physical Characterization:

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

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

the preparation of all standards.

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

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

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

Certified by:

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

< 00 **N**



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):

(T) = Target analyte

Physical Characterization:

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

Low P. S.

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

Part # 57033 Lot # 111323

| N O N O O | | |
|--|--|---|
| | 220 230 240 21 | m/z-> 210 |
| | | א. 50 ס |
| | | 5.068 |
| 150 160 170 180 190 200 | 120 130 140 10 | m/z-> 110 |
| | | N 07 00 |
| | | 5. OE6 |
| 50 70 80 100 | Ю О О | m/z-> |
| | | 1.0臣4 |
| [Linear] | 4o.1 [12.275 sec]:58105.D# [Count] [Linear] | [1] Spectrum No.1 2.0E4 |
| 11.55772 11.56201 1000.4 2.0 10043-35-3 2 mg/m3 orl-rat 2660 mg/kg | IN018 BV082016A1 1000 99.9988 0.10 17.3 11.5 | 1. Boric acid (B) IN018 E |
| Expanded SDS Information Target Actual Uncertainty (Solvent Safety Info. On Attached pg.) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 | Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) | Compound RM# |
| | 1000 4R | |
| Reviewed By: Pedro L. Rentas 071123 | 6UTB 5E-05 Balance Uncertainty | Nominal Concentration (µg/mL): 1 NIST Test Number: 6 |
| 40.0 Ammonium hydroxide Formulated By: Benson Chan 071123 | (B) 2.0% | |
| Solvent: MKBC8597V Ammonium hydroxide | 57005 Lo 071123 | CERTIFIED WEIGHT REPORT: Part Number: 5 |
| ce Material CRM ANAB ISO 17034 Accredited M 5종14 주가 5종14 | Certified Reference Material CRM | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |



Certified Reference Material CRM



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

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

| | | | | | | | Trace Me | tals | S Verifica | tion | by ICP- | Ś | (µg/mL) | | | | | | |
|-------|-------|----------------------------|--------|---------|-------|------------|----------|------|--------------|------|----------------|------|------------|------|-------|-----|------------|-----|-------|
| S S 2 | 40.02 | 0 2 2 2 2 2 | 40.02 | Er Dy | <0.02 | Ho | 4).02 | 臣 | 40.02 002 | A N | 40.02 20.02 | R 7 | A A 8 8 | s: % | A () | 3 3 | 2 A 3 R | : ¥ | 40.02 |
| | _ | n (1 | | 2 8 | A | - 5 | | Mg | <0.01 | õ | <0.02 | Rh | <0.02 | Ag | 40.02 | 3 | 6 8 8 | < 0 | 40.02 |
| | | 다. | A 0.02 | ត្ន ខ្ល | 40.02 | न ⊧ | | | 20.02 | 3 R | 40.02 | R | <0.02 | Na | 40.2 | Ţ | 40.02 | ₽¥ | <0.02 |
| _ | _ | 6 | <0.02 | ନ୍ନ | <0.02 | 5 | | | 3 6 | 7 | 20.02 | , Ku | 40.02 | Sr | <0.02 | Тв | <0.02 | × | <0.02 |
| | | ¥ | <0.02 | Au | <0.02 | 3 | | N a | 32 | 4 3 | <0.02 | 2 | 40.02 | 1 60 | 40.02 | S | -0.02 | Za | <0.02 |
| | | | | | | I | | ļ | | | 101 | ą | 2000 | La | 20.02 | 11 | 20.02 | N | 40.02 |

(T) = Target analyte

Physical Characterization:

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

In P. Str

Certified by:

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

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

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

Part #: 57005 Lot # 071123

| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | m/z-> | 2500 | m/z-> | 500 | m/z->- | 2.5 114 | 5.OE4 | 1. Ammonium dihydrogen phosphate (P) | Compound | Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa | CERTIFIED WEIGHT REPORT: Par Lo De | www.absolutestandards.com |
|--|--------|------|-------|-----|----------|------------|---------------|--------------------------------------|---|--|---|-----------------------------|
| R I D 2 M 4 C 1 M 52 15 Interview Lat* Solvent: 2111021 Nitric Acid Provide (P) 2% 40.0 Nitric Acid 2000/2 0.058 Failure inventienty Environmenty 2000/2 0.058 Failure inventienty Environmenty Environmenty Nominia Party Uncertainty Assay Target Actual Actual Commutated By: Perford L Ren 10000 ease 0.10 27.5 72.7287 72.7287 72.7284 10000.0 30.0 772.78-1 5mg/r 12.074 aeoc)15891 15. D/r County (Linear) Ease Store 5mg/r 5mg/r 30 40 sio eo 70 sio sio sio sio 30 40 sio eo 70 sio sio sio sio 30 40 sio eo 70 sio sio sio 30 40 sio tio | N O | | 110 | | 10 | | [1] Spectrum | | - | Expiration Date: Recommended Storage: I Concentration (µg/mL): NIST Test Number: Weight shown below was d | DRT: Part Number: Lot Number: Description: | om |
| RICZINGLA MITELS Bolvent: 21110221 Nitric Acid IDP 2% 40.0 Nitric Acid SEC5 Balance locentary (mL) Nitric Acid Formulated Br. Formulated Br. SEC5 Balance locentary (mL) Nitric Acid Formulated Br. Lawrence Balance (mL) Formulated Br. Lawrence Balance (mL) Formulated Br. Lawrence Balance (mL) Source It Mitels Acid Formulated Br. Lawrence Balance (ML) Source It Mitels Acid Formulated Br. Lawrence Balance (ML) Source It Mitels Acid Formulated Br. Formulated Br | 2220 | | 120 | | N. O | | | | Lot Number | 041726 Ambient (20 10000 6UTB 6UTB | 57115 041723 Phosphore | 5 |
| Hric Acid Iric Acid Iric Acid Iric Acid Iric Acid Actual Actual Actual Expanded Expanded Expanded SDS Inf Expanded SDS Inf Solvent Safety Inf eight (g) Conc. (ug/mL) · (AS# OSHA PEL) 2.7289 10000.0 20.0 7722-76-1 5 mg/m 2.7289 10000.0 20.0 7722-76-1 5 mg/m 150 170 180 190 190 190 | 230 | | 130 | | ຜ. ວ | | 2.074 sec]:58 | | | 00.02 | us (P) | R |
| Hric Acid Frite Acid Formulated By: Lawrence Ba Formulated By: Pedro L. Ren Expanded Actual Uncertainty (Solvent Safety Inf eight (g) Conc. (ug/mL) - 4/- (ug/mL) CAS# OSHA PEL 2.7289 10000.0 20.0 7722-76-1 5 mg/m 2.7289 10000.0 1722-76-1 5 mg/m 160 170 180 190 190 | 240 | | 140 | | 4 | | 3115.D# [Cot | | Uncertainty Assay Purity (%) (%) | 2% Balance Uncertainty Flask Uncertainty | Solvent: | 22/09/12 |
| Formulated By: Lawrence Ba Formulated By: Lawrence Ba Reviewed By: Pedro L. Ren Conc. (ug/m), -/- (ug/m), CAS# OSHA PEL 10000.0 20.0 7722-76-1 5 mg/m 10000.0 20.0 7722-76-1 5 mg/m 10000.0 eio eio | 250 | | 150 | | S O | | ınt] [Linear] | | | | | |
| Formulated By: Lawrence Ba Formulated By: Pedro L. Ren Expanded SDS Inf Uncertainty (Solvent Safety Inf +/- (ug/mL) CAS# OSHA PEL (20.0 7722-76-1 5 mg/m 20.0 7722-76-1 5 mg/m 20.0 190 90 | 260 | | | | | | | 2.7289 10000. | Actual Actual sight (g) Conc. (µg/1 | rric Acid | tric Acid | 15815 |
| 22-76-1 5 mg/m | | | | | 1 | | | 20.0 | | Formulated B | Q | |
| o 200 | | | 4 | | | | | | SC (Solvent Saf CAS# OSH/ | Ped | Gerence / | |
| .hed pg.) LbS0 LbS0 | | | | | | | | | DS Information fety Info. On Attac A PEL (TWA) | L. Rentas | Jan | https://At |
| g 3186 SRM | | | 9 | | J | | | | 0 | 041723 041723 | | tps://Absolutestandards.com |

| Abs | Absolute (800-368-1131 www.absolute | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | lards , ds.com | Inc. | - | | | | ĉ | rtified Re | eren | Certified Reference Material CRM | ial CR | M | | | | | https AF | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | 4 Accredited cate Number andards.com |
|------------|---|---|---|--|---|---|---|--|---|--|------------------------------------|---|--------------------------------|---|---------------------|------------------------|-------------|-------------------------------|---------------|--|--|
| - | nstrum | iental A | nalysi | s by Indi | uctive | ły Coupl | ed Pla | Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS); | s Spec | troscopy | (ICP | -MS): | | | | | | | | | |
| _ | | | | | | | | Trace Metals | etals | Verifica | Ition | Verification by ICP-MS | 1.00 | (µg/mL) | | | | | | | |
| - | A | 40.02 | 8 | 40,02 | Ą | 40.02 | H | 40.02 | E | A) ()2 | Z | A)22 | 7 | A).02 | Se | A 2 | ŧ | AB | W | | |
| | | A.22 | 5 2 | A0.2 | ម្មា | 40.02 | Но | 40.02 | Ŀ | 40.02 | NB | <0.02 | Re | 40.02 | ŝ | 40.02 | Te | 40.02 | c : | 40.02 | |
| | Ba | | <mark>ዮ</mark> የ | 8 8 8 8 | <u>ନ</u> ଜ | 40.02 20 | 부 부 | 40.02 20 | Mg | 40.01 002 | r S | A A 8 | ₽ ₽ | A A 3 S | Å. | A0.02 | 1 11 | A 600 | \$ < | 8 8 | |
| | | 10.0> | ព្ | <0.02 | ណ្ឌ | <0.02 | 장 | <0.2 | Hg | 40.2 | שי | T | R Q | 40.02 | K 2 | 8.8 2 | | <0.02 | 4 'B | 60.02 20.02 | |
| | B | 8 8 22 22 | 5 S | 8 8 22 22 | ନ ବ | 40.02 20 | 32 | 4 4 A | N W | 4 4 8 8 | * 7 | A0.02 | s s | A A 3 S | y s | 88 | 1 S | A A A A A A A A A A | 2 B | 88 | |
| | | | | | | | | | | (T)= Ta | (T)= Target analyte | alyte | | | ĺ | | | | | | |
| hand | hysical | Physical Characterization: | cteriza | ution: | | | | | | | | | | | | | | Cer | Certified by: | y: | |
| | Iomogen | eity: No I | heteroge | neity was | observ | ed in the pr | eparati | Homogeneity: No heterogeneity was observed in the preparation of this standard. | ındard. | | | | | | | | (| h | J. | Ŵ | |
| * * | The cel Purified | rtified va l acids, | alue is 18.2 m | The certified value is the concen Purified acids, 18.2 megohm dei the menantion of all standards | centrat deioniz | tion calcul red water, | lated f | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all etandarde | metric s A gla | and volu | metric nd the | measure highest p | nents Jurity r | unless oth aw mater | nerwisc ials are | e stated. 9 used in | | | | | |
| * * * * * | All star Standa Standa All Star Uncerta Measur | ndard co rds are rds are ndards s ainty Re rement | ntaine prepare certife hould I ference Result, | rs are me ad gravin d (+/-) 0 es storec e: Taylor " NIST Te | eticulo netrica).5% o d with r, B.N. echnic | ally using the stat caps tigh and Kuya al Note 1; | hed pri balanc iced val it and it, C.E. 297, L | * 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). | e calit other ropriat nes for nment | brated wit wise stat te laborat Evaluatir Printing (| h weig ed. ory co Office, |)hts trace onditions. Expressir Washingt | able to og the l on, D.(| to NIST (see above). e Uncertainty of NIST D.C. (1994). | e abov ty of N | e). IIST | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | · | | | | | | | |
| | | | | | | | | | | 8 | | | | | | | | | | | |
| Part # | 57115 | | Lot # 041723 | 1723 | | | | | | | 2 of 2 | of 2 | | | | | Print | Printed: 2/8/2024, 5:01:22 PM | 24, 5:0 |)1:22 PM | |

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| m/z-> | N. 01 00 | 5. O M 8 | m/z-> | 5.0E7 | 1.0E8 | m/z-> | N. 00 00 | 5.0E5 | Ammonium sulfate (S) | Compound | NIST Test Number: 6UTB Weight shown below was diluted to (mL): | Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): | Part Number: Lot Number: Description: | 800-368-1131 www.absolutestandards.com |
|---------|----------------|-------------------|----------|-------|-------|---|--|---------------------------------------|------------------------|--|---|--|--|---|
| 210 | | | 110 | | | 10 | | [1] Spectrum No.1 | IN117 | RM# | umber: low was dilute | n Date: lorage: lg/mL): | <u>Part Number:</u> Lot Number: Description: | |
| 220 | | | 120 | | | NO | | - | IN117 SLBR7225V | Lot Number C | GUTB d to (mL): | 122926 Ambient (20 °C) 1000 | <u>57016</u> 122923 Sulfur (S) | |
| 230 | | | 130 | | 9 | 30 | | 33.603 80 | 1000 | Nominal F Conc. (µg/mL) | 4000.0 5 | ĉ | | <i>b</i> |
| N 40 | | | 140 | | | b | den gegen og gener første kommen och som en forse og | 33.603 sec]:57016.D# [Count] [Linear] | 99.9 0.10 24.3 | Purity Uncertainty Assay (%) Purity (%) (%) | 5E-05 Balance Uncertainty 0.06 Flask Uncertainty | | Solvent: | Certified Re |
| N 80 | | | 100 | | | 50 | | Count] [Lin | .3 16.4979 | say Target 6) Weight (g) | Y | | Lot # 122923 | fere 12 |
| N80 | | | 0 | | | 8 | | 9 9 7 | 16.4980 | Actual Weight (g) | | | ASTM Type 1 Water | aterial CRM |
| | | | 170 | | | 70 | | | 1000.0 | Actual (Conc. (µg/mL) | 5 | | 1 | rm 167816- |
| | | | 180 | | | 80 | | | 2.0 77 | Expanded Uncertainty +/- (µg/mL) | Reviewed By: | M | Formulated By: | |
| | | | | | | Complete and complete | | | 7783-20-2 | (Solvent : CAS# 05 | Pedr | \$ | a and a second sec | |
| | | | 190 | | | 0 | | | NA | SDS Information It Safety Info. On Attac OSHA PEL (TWA) | Pedro L. Rentas | e la | Benson Chan | http |
| | | | 2000 | | | 100 | | | ort-rat 4250mg/kg 3181 | SDS Information (Solvent Safety Info. On Attached pg.) * OSHA PEL (TWA) LD50 | 122923 | 7 | 100002 | AR-1539 Certificate Number https://Absolutestandards.com |

| Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | * All standard containers are meticulously cleaned prior to use. * All standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * 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 | 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 measurement of all standards | | Homogeneity: No heterogeneity was observed in the preparation of this standard. | Physical Characterization: | (T) = Target analyte | AI A002 Cd A002 Pr A002 Pr | Trace Metals Verification by ICP-MS (µg/mL) | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
|--|---|--|--------|---|----------------------------|----------------------|--|---|---|--|
| 30 | | | 5 2 | I She | Certified by: | | MI MI MI 40.02 | | | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |

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| | - | 260 | 250 | 240 | 230 | | 220 | 210 | m/z-> |
|---|-------------------|----------------------|----------------------|--|---------------|---------------------------|--|--|--|
| | | | | | | | | | 1.0巨5。 |
| | | | | | | | | | 2.0厘5 |
| 180 190 200 | 170 | 160 | 150 | 140 | 130 | р. 9 | 120 | 110 | m/z-> |
| | | | | | | | | | 2,5E |
| | | | | | | | | | 5.0E5 |
| 80 80 100 | 70 | eo | 50 | 40 | 8 | magan Raji Anana ya Anany | N | 10 | m/z-> |
| | | | | | | | | | 1000 |
| | | ear) | ount] [Lin | 24.004 sec];58116,D# [Count] [Linear] | ¢ sec];58 | [24.00 | | [1] Spectrum No.1 | 2000 |
| 20.0 7763-20-2 NA orf-rat 4250mg/kg 3181 | 10000.1 | 82,4682 | 82.4675 | 0.10 24.3 | 99,9 | 10000 | IN117 SLBR7225V | IN11 | 1. Ammonium sulfate (S) |
| Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.) NIST +/- (ug/mL) CAS# OSHA PEL (TWA) LDSO SRM | (g) Conc. (µg/mL) | Actual Weight (g) | Target Weight (g) | Uncertainty Assay Purity (%) (%) | Purity (%) | Nominal Conc. (µg/mL) | Lot. Number | RM# | Compound |
| i By: Ped | [F | | | Balance Uncertainty Flask Uncertainty | 0.058 | 1999.48 | led to (mL): | Weight shown below was diluted to (mL): | Weight show |
| Lawrence barry | 1 1 | | | | | 20 °C) | 071126 Ambient (20 °C) 10000 Sum | Expiration Date: nended Storage: htration (µg/mL): %T Test Number: | Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Teet Number |
| around Bring | Type 1 Water | ASTM Ty | Lot# 071123 | Solvent: | | E) | 57116 071123 Sulfur (S) | <u>PORT:</u> Part Number: Lot Number: Description: | CERTIFIED WEIGHT REPORT: Part N Lot N Desc |
| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | CRM | | ference M | Certified Reference Material | R a | | | om | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
| | | | | | | | | And in case of the local division of the loc | |

| 800-368-1131 www.absolutestandards.com | | 0 | Certified Reference Material CRM | nce Material C | RM | | | • | ANAB ISO 1: AR-1539 Ce https://Absolut | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |
|---|---|---|--|---|---|-------------------------|-----------|------------|--|--|
| Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | ictively Coupled | Plasma Mass Sp | ectrometry (IC | P-MS): | | | | | | |
| | | Trace Metals | | Verification by ICP-MS | IS (µg/mL) | | | | | |
| AI <0.02 Cd <0.02 | Dv 40.02 | A M | -12 | | | a dista div. | ALL MERIC | | A STREET STREET STREET | |
| 40.02 Ca | | 40.02 | 40.02 40.02 | Ni <0.02 Nb <0.02 | Pr <0.02 Re <0.02 | Si Se | | | | A 6.3 |
| 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | Gd <0.02 | In <0.02 N | Mg <0.01 C | | | | | | < 0 | <0.02 |
| 40.02 | Ga 40.02 | Fe <0.2 Hg | A A 3 12 | 8 8 | | | 12 1 | | 40.02 Y 40.02 | |
| B (UUZ CI 40,02 | Au <0.02 | <0.02 | <0.02 | | Sc <0.02 | Ta o | <0.02 | | 40.02 21 21 40 | 40.02 |
| Physical Characterization: | | | (T)= Target analyte | alyte | | | | ۲ ۲ | Certified by: | |
| Homogeneity: No heterogeneity was observed in the preparation of this standard. | oserved in the prepa | ation of this standard | | | | | | | | 1 |
| | | | | | | | (| the second | P.S. | |
| * The certified value is the concentration calculated from gravimetric and volumetric measurements * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity in the preparation of all standards. * All standard containers are meticulously cleaned prior to use the preparation of the preparation of all standards. | ntration calculate ionized water, ca | d from gravimetri librated Class A g | c and volumetric lassware and the | c measurement highest purity | s unless otherwise stated. raw materials are used in | ise state are used i | 5.6 | | | |
| * 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. | trically using bala % of the stated | value, unless othe | brated with weighwise stated. | phts traceable : | to NIST (see ab | ove). | | | | |
| * Uncertainty Reference: Taylor, Measurement Result," NIST Tec | vith caps tight ar B.N. and Kuyat, (hnical Note 1297 | id under appropria 2.E., "Guidelines fc , U.S. Governmen | ite laboratory co r Evaluating and t Printing Office, | I Expressing the Washington, D | ⁹ Uncertainty of NIST).C. (1994). | F NIST | | | | |
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| * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to * 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 Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D. | itrically using bails bails of the stated with caps tight ar B.N. and Kuyat, C hnical Note 1297 | prior to use. ances that are cali value, unless othe d under appropria 2.E., "Guidelines fo , U.S. Governmen | brated with weig rwise stated. re laboratory co or Evaluating and t Printing Office, t Printing Office, | ghts traceable . onditions. I Expressing the Washington, D | to NiST (see ab 3 Uncertainty o).C. (1994). | ove). F NIST | | | | |

2 of 2

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| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | m/z> | ζι Ο Μ Ο | m/z-> 1.0E6 | ₩/z-> 2.0E6 | 5000 2500 | Compound 1. Ammonium hexafluorosilicate (Si) | Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa | <u>CERTIFIED WEIGHT REPORT:</u> Part Nu Lot Nu Descri | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
|--|------|-------------------|----------------|----------------|-----------------------------|--|--|--|--|
| Certified Reference Material CRM A: 12: p 4: 2.4 Ph/SI R Solvent: 24002546 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 40.0 2% 1140 1140 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.865 111 12.9 111 12.9 111 12.9 111 13.865 111 14.0 111 14.0 111 14.0 111 11.9 <th></th> <th></th> <th></th> <th></th> <th></th> <th>Lot RM# Number IN009 SID082022A1</th> <th>s dilute</th> <th>mber: mber: ption:</th> <th>, Inc.</th> | | | | | | Lot RM# Number IN009 SID082022A1 | s dilute | mber: mber: ption: | , Inc. |
| Instant Image: Constraint of the con | ≥40 | | 140 | 4 | 1.393 sec]:58014.D# [Count] | Purity Uncertainty Assay (%) Purity (%) (%) 99.999 0.10 14.4 | 2% 5E-05 Balance Uncertainty 99.48 0.058 Flask Uncertainty | | Certified Reference |
| v: Aleah O'Brady V: Aleah O'Brady CAS# OSHA PEL (TM 919-19-0 2.5 mg/m: 919-19-0 150 | N | | 160 | 0- | Linear] | Actual Actual Weight (g) Conc. (Jy/mL) 13.8855 1000.0 | Nitric Acid | Nitric A | 182 |
| | | | (*) | | | (Solvent S CAS# () 18919-19-0 | Ped Ped | ha | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |

≤ % >



Certified Reference Material CRM



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

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

| | | | | | | | I race M | etals | Verifica | ition | by ICP-N | 5 | g/mL) | | | | | | |
|----------|--------------|-----|--|----------|-------|----|---------------------|-------|----------------------|-------|--------------|----|-------|------------|---|-----------------------|-------|-----|---------------|
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| Ac | 3 | Ş | 3 | đ | 3 | • | | ; | | | | 1 | | ç | • | 10 | 70.02 | c | 20.02 |
| J I | 1 | Ę | NU.U2 | 2 | 20.05 | B | 20.02 | Mg | <0.01 | 9 | 40.02 | R | 4).02 | Ą | A0.02 | H | 40.02 | < | A).02 |
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| d. | 3 | 2 | 2 |) | | | | 9.1 | 10.4 | 'n | 20.02 | NU | <0.02 | ų | 20.02 | | 20.02 | × | <0.02 |
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| t | <0.02 | 2 | <0.02 | Au | 40.02 | \$ | A0.02 | Nd | 40,02 | ĸ | 4 0.2 | 8 | 40.03 | <u>_</u>] | 3 | 1 | 3 | 2 | 3 |

(T) = Target analyte

Physical Characterization:

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

Son P. Shr

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

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

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Part # 57014 Lot # 122023



1 of 2

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|------------------------|---------|------------------------|
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Certified Reference Material CRM



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

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

| Al 40.02 Sb 40.02 As 40.02 Ba 40.02 Ba 40.02 Be 40.01 Bi 40.02 B 40.02 | |
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(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 Lot # 111623

| Image: | TT/Z-> | 2500 | 5000 | m/z-> | 500 | 1000 | N.00 M.4 | 5.0E4 | 1. Ammonium dihydrogen phosphate (P) IN008 PvœzoisAi | Compound | Weight shown below was diluted to (mL): | NIST Test Number: | Recommended Storage: Nominal Concentration (ug/mL): | Expiration Date: | Lot Number: Description: | CERTIFIED WEIGHT REPORT: Part Number: | www.absolutestandards.com |
|--|--------|------|------|-------|-----|----------|-------------|-------|--|--|---|---------------------------|--|------------------|-----------------------------|--|---------------------------|
| ric Acid Fic Acid Formulated By: Formulated | | | | 120 | | 20 | | | | Lot Number | | | | | | | R |
| ric Acid Fic Acid Formulated By: Formulated | 240 | | | 140 | | 40 | | | 89.899 0.10 27.5 7.275 | Purity Uncertainty Assay (%) Purity (%) (%) | 0.058 Flask Uncertainty | 5E-05 Balance Uncertainty | | | | | 00 |
| Prieved By: Programity Procertainty Procentainty Processory P | | | | | | | | | .2730 | Actual Actual Weight (g) Conc. (µg/mL) | | | | Nitric Acid | | | M5820 |
| | | | | 180 | | | | | 7722-76-1 |) CAS | | | Here ten | Lawrence | forme (| | ٩ |

| | 01:19 PM | 024, 5:C | Printed: 2/8/2024, 5:01:19 PM | Print | | | | | | 2 of 2 | | | | | | | 123 | Lot # 091123 | Lot | 57015 | Part # |
|--|--|---------------|---|------------------|---------------------------------------|---------------------------------|--|-------------------------------|--|---|---|---|--|--|---|---|--|---|---|--|--|
| | | | | | | | | | | | 2 | | | 5 | | · · | | Ð | | | |
| | | | | | e). IST | rials are e abov ity of N | ity raw materials are us le to NIST (see above). the Uncertainty of NIST , D.C. (1994). | able to g the l on, D.(| highest p ts trace; ditions. Xpressin Vashingt | id the f id. yry con y and E ffice, V | sware ar ated with ise state laborate ivaluation rinting O | A glas calibr otherw opriate is for E ment P | ed Class to use. that are , unless (der appro Guideline Governr | calibrat ad prior alances d value and un , C.E., " 97, U.S | d water, sly clean y using b y using b the state the state hps tight nd Kuyat Note 12 | eionize Is. ticulou: ticulou: 5% of 1 S% of 1 B.N. a chnical | Purmed 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). | 8.2 me of all s repared ertifed ertifed prence: esult," | acids, 1 aration s are pi s are ci ards sh nent Refe | Purmed acids, 18.2 meg the preparation of all si All standard containers Standards are prepared Standards are certifed (All Standards should be Uncertainty Reference: Measurement Result," Measurement Result, " Measurement Result," | * * * * * * |
| · | A. | 1º | in the second second | (| stated | henwise | inless of | nents | neasurer | netric n | nd volur | letric a | m gravim | ted fro | n calcula | intratio | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated | ue is th | fied val | he certi | + + 7 |
| | y: | Certified by: | Ca | | | | | | | | | wland | of this stan | paration | in the pre | observed | r nysical Unaracterization: Homogeneity: No heterogeneity was observed in the preparation of this standard | Sterrizal eterogen | y: No he | r nysical Characterization: Homogeneity: No heterogeneity | Ho |
| | | | | | | | | | alyte | (T) = Target analyte | () = () | | | | | | | | | | Į |
| | 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | 22 × 2 × C × | 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 | ෘ망칰랔극 乌 역 | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | Ta Sr Nage Sc | 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 | Sc Sm | 40.22 | * * * * \$ Q N N | 400 400 400 400 400 400 400 400 400 400 | LL Mg Mg Nd | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | ****** | 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | A C C C E F | 4 4 8 8 4 4 8 8 4 4 8 8 8 8 8 8 8 8 8 8 | 5 S S S S S S S | | | B B B B A S A |
| | | | | | | | (µg/mL) | 1 | Y ICP-N | tion b | Verification by ICP-MS | tals V | Trace Metals | 글 | | | | | | | |
| | | | | | | | | | MS): | (ICP-) | rometry | Spect | na Mass | d Plası | Couple | ıctively | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | nalysis | ntal Ar | strume | = |
| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | VAB ISO 17(R-1539 Certi s://Absolutes | http: A | | | | | 2 | ial CRM | e Mater | ferenc | Certified Reference Material | Cert | | | V | | Inc. | ards, Is.com | standard | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | Absolute 800-368-1131 www.absolute |
| | | | | | | | | | | | | | | | | | | | | | |



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

These instructions are for advisory purposes only. If any apparent conflict exists between these NOTE: 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 $\frac{1}{2}$ M5528 - 3 M5528 - 3 M553 - 3130 123 the analyses.

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

> Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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

RMs ICV 1, 5, 6 SFAM (1)

Page 1 of 2

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



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



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

| APTIM | Instructions for a reason |
|-----------|--|
| ICV1-1014 | Instructions for QATS Reference Material: Inorganic ICV Solutions |
| | For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid. |
| ICV5-0415 | For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K ₂ Cr ₂ O ₇ and 5% (v/v) nitric acid. |
| | For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light. |
| | |

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

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

| | ICV1-1014 | |
|---------|--|--------------------------|
| Element | Concentration (µg/L) (after 10-fold dilution) | Concentration (µg/L) |
| AI | 2500 | (after 50-fold dilution) |
| Sb | 1000 | 500 |
| As | 1000 | 200 |
| Ba | 520 | 200 |
| Be | 510 | 100 |
| Cd | 510 | 100 |
| Ca | 10000 | 100 |
| Cr | 520 | 2000 |
| Co | 520 | 100 |
| Cu | 510 | 100 |
| Fe | 10000 | 100 |
| Pb | 1000 | 2000 |
| Mg | 6000 | 200 |
| Mn | 520 | 1200 |
| Ni | 530 | 100 |
| K | 9900 | 110 |
| Se | 1000 | 2000 |
| Ag | 250 | 200 |
| Na | 10000 | 50 |
| TI | 1000 | 2000 |
| V | 500 | 210 |
| 2n | 1000 | 100 |
| | 1000 | 200 |

| | ICV5-0415 | | ICVIC DADD |
|---------|---|-----------------|--|
| Element | Concentration (µg/L) (after 100-fold dilution) | Analyte | ICV6-0400 Concentration (µg/L) (after 100-fold dilution) |
| Hg | 4.0 | CN [.] | 99 |

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

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



| Part# 57003 Lot # 062124 | * The certified value is the concentration calculated from gravimetric and volumer * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and 1 the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravinetrically using balances that are calibrated with w * Standards are certified (+/) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate iaboratory * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating of Measurement Result," NIST Technical Note 1297, U.S. Government Printing Off | Homogeneity: No heterogeneity was observed in the preparation of this standard. | Physical Characterization: | Al 40.02 Cit 40.02 Dr 40.02 Hd Sb 40.02 Cit 40.02 Ein 40.02 Hd As 40.2 Cit 40.02 Ein 40.02 In Ba 40.02 Cit 40.02 Gd 40.02 In Ba 40.02 Cit 40.02 Gd 40.02 In Ba 40.02 Cit 40.02 Gd 40.02 In Bi 40.02 Cit 40.02 Ge 40.02 In Bi 40.02 Cit 40.02 Ge 40.02 In Bi 40.02 Cit 40.02 Ain 40.02 Ia | | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | Absolute Standards, Inc. 800-368-1131 www.absolutiestandards.com |
|---------------------------------|---|---|----------------------------|---|-------------|---|--|
| 2 01 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 standard. * 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 prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards broud by stoud with cases tight and under appropriate laboratory conditions. * All Standards are prepared with cases tight and under appropriate laboratory conditions. * Mucertainty 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). | this standard. | | 40/02 Li T Nh 40/02 Hr 40/02 And 40/02 Li An | -MS (µg/mL) | Mass Spectrometry (ICP-MS): | Certified Reference Material CRM |
| Printed: 6/24/2024, 11:20:08 PM | Ъ. | Sur P. S. | Certified by: | Site Gall Tite Gall U Gall Site Gall Tite Gall Site Gall Si | | | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |

Page 1 of 4

ក⁰⁸ = ក្រុងអាស់ ដែល ភ្លេង ភ្ល

Z = 1000BL = $\sup_{x \in \mathcal{A}} (\pi_x) = O_{CRM/RM} = k \left(u^2_{Char} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{C}_{bb} \right)^{1/2}$ $\mathsf{M}^{i} = (1/\mathsf{n}^{\mathsf{clust}\,i})^{\Sigma} \setminus (\Sigma(1/(\mathsf{n}^{\mathsf{clust}\,i})_{\Sigma})$

nienesty standard uncertain ucherts mort arone enti = a fanta lisnegomort ettod,ot ettod = dd^u adnere vitidats mot gnot = _{ad}t $\label{eq:spinor} \min \left\{ x \right\} = U_{CRM/RM} = k \left\{ u^2_{char} * u^2_{bb} + u^2_{bb} + u^2_{bb} + u^2_{bb} \right\}^{4}$

$$\begin{split} \chi_{CRM,FRM} = & (\chi_{o}) \; (u_{char, o}) \\ \chi_{a} = mean of Assay Method A with ut and a charter of the standard uncertainty of uncertainty of the standard uncertainty$$

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

Certified Value, X_{CRMMM}, where two or more methods of characterization are used is the weighted mean of the results: Characterization of CRM/RM by One Method Characterization of CRM/RM by Two or More Methods

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent to following equations are used in the calculate/K=2.

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

ICP Assay NIST SRM 3162a Lot Number: 130925 1002 ± 4 hg/mL

F# bodteM vssA

g = Jojoej

un pepuedra w

(1x) (1w) = X(wi) (xi)

:noiternotnl ysseA

1.012 g/mL (measured at 20 ± 4 °C) Density: 1002 ± 5 µg/mL sulsV beitified

 $\chi_q = mean of Assay Method I with standard uncertainty updat 1$ w₁ = the weighting factors for each method calculated using the tothe weighting actions for each method with the standard uncertainty updat 1

CERTIFIED VALUES AND UNCERTAINTIES 3.0

Starting Material Purity: 99.9975% Starting Material Lot#: 2094 Starting Material: In Metal unineti l 1 000 hg/mL ea: :(s)ətylanA \ əulsV :xinteM

tr. HF 2% (v/v) HNO3 27991717-2T Lot Number: **LITED** Catalog Number: Product Code:

Single Analyte Custom Grade Solution

PRODUCT DESCRIPTION 0.S

Number QSR-1034).

the Competence of Reference Material Producers" and ISO/IEC 17025, "Ceneral Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Vantures is also an ISO 9001 registered manufacturer (QSR Certificate Inorganic Practices is also an ISO 9001 registered manufacturer (CSR Certificate INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for



ACCREDITATION / REGISTRATION 0.r

300 Technology Drive Christiansburg, VA 24073 USA Christiansburg, VA 24073

R:2/22/24

info@inorganicventures.com E: 240-282-3015 E: 240-282-3030

Refine your results. Redefine your industry. Certificate of Analysis 6LESH' 8LESH

4.0 TRACEABILITY TO NIST

sbecueq. - This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRMRM uncertainty error and the measurement, weighing and volume dilutiton errors. In rare cases where no NIST SRMRM are available, the term "in-house std." is approximately and the term and term and term and term and term are cases where no NIST SRMRM are available, the term "in-house std." is a provided.

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

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)

.my €.0 a2 M 0732£0.0 > ⊨N O 832000.0 > ⊔∃ M 8€2000.0 > ⊵A M ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to CRMRMs 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 up of the method for each element of the property effection of the method for the met

| | | | | | | | | | | | - | | | | • | | | | |
|----------|---|----|------|----------|---|----|---|------------|---|----|-----|----------|---|----|---|----------|---|------------|---|
| | | | 9 | 0:000536 | > | ٩٨ | Μ | 0.004900 | > | эS | 0 | ¢77000.0 | | oM | Μ | 892000.0 | > | ΞL | Μ |
| | | | 9 | 941200.0 | > | × | Μ | 926900.0 | > | qs | Μ | 0.003267 | > | υM | 0 | 892000.0 | > | DÀ | M |
| | | | 1 | 0.000473 | | M | Μ | | > | S | - į | 0.005445 | > | БM | 0 | 068010.0 | > | ng | 0 |
| | | | 9 | 98610.0 | > | Λ | Μ | 0.000269 | > | nЯ | Μ | 0.000268 | > | nŋ | Μ | 0.000268 | > | sÖ | M |
| | | | 8 | 0.000268 | > | Π | Μ | 0.000268 | > | ЧЫ | Μ | 0.027225 | > | П | 0 | 297000.0 | | CL | M |
| | | | 8 | 0.000268 | > | шŢ | M | 89Z000.0 | > | əЯ | W | 0.000268 | > | гŋ | W | 0.004293 | > | 00 | W |
| | | | 5 | 0.000268 | > | Ш | Μ | 0.000268 | > | ЧЯ | Μ | 271100.0 | | К | W | 0.000268 | > | 9 <u>0</u> | W |
| | | | | | > | Ш | S | 0.000536 | > | Ъł | Μ | 692000.0 | > | 4 | Μ | 892000.0 | > | PO | M |
| | | | 8 | 0.053663 | > | 41 | Μ | 0.000268 | > | Ч | Μ | 0.002683 | > | uj | Μ | 929000.0 | | сa | 0 |
| | | | | \$£100.0 | > | θT | Μ | 0.000268 | > | Pd | Μ | 0.000268 | > | ен | Μ | 609100.0 | > | B | M |
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| | | | ę | 60000.0 | | ٦S | 0 | 0.000269 | > | sO | Μ | 0.002146 | > | 99 | Μ | 0.008929 | > | В | 0 |
| | | | - | 60000.0 | | us | Μ | 068010.0 | > | !N | 0 | 0.000268 | > | ΡÐ | M | 778400.0 | > | nΨ | W |
| | | | 8 | 0.00026 | > | шS | Μ | 0.000268 | > | PN | Μ | 0.000268 | > | БÐ | M | 986800.0 | > | sA | M |
| 0.043560 | > | ۶Z | | 67400.0 | | !S | 0 | 0.043560 | > | ٩N | 0 | 0.003225 | | θ٦ | 0 | 278000.0 | | IA | 0 |
| 792600.0 | > | uΖ | 0 \$ | 0.00120 | | əS | Μ | 0.032670 | > | вΝ | 0 | 0.000268 | > | nΞ | Μ | 0.000536 | > | ₿¥ | M |
| | | | | | | | | | | | | | | | | | | | |

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

- For the calibration of analytical instruments and validation of analytical methods as appropriate. 9.0 INTENDED USE

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Page 2 of 4

Page 3 of 4

- Chemical Testing - Accredited / A2LA Certificate Number 883.01 "serveter of the second second and the Competence of the Competence of Testing and Calibration Laboratories."

- QSR Certificate Number QSR-1034

nottertizigeA metevs inemegeneM villsuD 100e OSI 1.01

WOITATNEMUDOD GRADNATS YTILAUD

0.01

Homogeneity data indicate that the end user should take a minimum server of 0.2 m L or 2.0 m L or 2 - This solution was more according to the superior superior of the form as the solution of the homogeneous. المستحدم المرابعة الم .viienegeneity.

Please refer to the Safety Data Sheet for information regarding this CRMRM. HOMOGENEITY 0'6

NOITAMAORNI SUOGAASAH 0.8

| ۲۹۸۱۵۵۲۹۵۵) ۱۹۸۱۶۵۶ ۲۲۵۶۵ (۱۹۹۵۶۵ ۲۲۵۶۵ ۱۹۵۱ ۱۹۵٫۱۶۵۲۵۵ ۱۹۵٫۱۶۵٬۵۲۱ | .sselo n r r r | 0.0054 / 0.00052 µg/mL 0.0054 / 0.00038 µg/mL 0.0053 / 0.00034 µg/mL 10 not be prepared or stored ir 10N | CP-OES 323.452 nm (CP-OES 334.941 nm (CP-OES 334.941 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm) |
|--|-------------------------|--|--|
| SET Interferences (underlined indicates severe) 32S160, 32S14N, | Orde A/N | 14 pt | ICP-MS 48 amu |

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

1:1:1 H2O / HF / H2SO4 or fuse ash with pyrosultate it oxide is as plastic pigment and likely in prookite Notentity: Oxde - low temperature history and sortanty - ineer (sortant in 122) in source heads Notentity: Oxde - low temperature history (-800EC) brookite (fuse in Pto with KS2207); Ores (f TI Containing Samples (Preparation and Solution) - Metal (Soluble in H2O / HF caution -powder reacts violentino: Ovide , Iour Inergene , or entile (Discoluted by Inergene) and Ferdinal Market (Soluble In 1997).

HINO3 / LORE OFFICE ONDER (10,000 ppm single element solutions as the TI(F)6-2 chemically stable for years in HNO3 / totalenet (an LDPE containet. 2-5% HNO3 / totalenet (an LDPE containet. TI Containing Samples (Prenaration and Solution) - Metal (Solution in 200 / LE containe and tot years) with a fendency to hydrolyze forming the hydrafied 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 point and element solutions as the Ti(F)6-2 chemically stable for year media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of thansition elements unless they are fluorinated). Stable with more inorganic anions with a tendency to hydrolyze forming the hydrafed oxide in all dilute acids except HF. Chemical Compatibility - Soluble in concentrated HCI, HF, H3PO4 H2SO4 and HVO3. Avoid neutral to basic S-8(T)T 6 4+ 78.74 - noiluite in Solution (Chemical Form in Solution - 47.74 6 T(F)6-5-- For more information, visit www.inorganicventures.com/TCT Afomic Weinher Valence: Coordination Winnher: Chemical Equa

reported density. Do not pipette from the container. Do not return removed aliquots to container. - 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 renorted density. To not other from the container. To not return removed alternots to container.

Page some more served to the served to the served to the ordent of the ordent 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 the rescaled to the test to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss. - While stored in the sealed TCT bag, transpiration of this CRAWRM is negligible. After opening the sealed TCT had transmission of the CDMMAN will occur recutification increase in the source concentration of the is

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

Page 4 of 4

Certifying Officer:

Chairman / Senior Technical Director

201928

Paul Gaines

-

Thomas Kozikowski Manager, Quality Control

Certificate Approved By:

0.2r

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

- 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.

- Sealed TCT Bag Open Date:

11.3 Period of Validity stability studies conducted on property stored and handled CR/WRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

- The lot expiration date reflects the period of time that the stability of a CRMMM can be supported by long term

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

- June 17, 2027

11.2 Lot Expiration Date

The cartification 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.

June 17, 2022

11.1 Certification Issue Date

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 0.11

norganic Ventures, 300 Technicky Drive, Christianeburg, Ve. 24073, USA; Telephone: 800,669,678; 540,585,3030, Fax: 540,562,5015; Innegan

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

| ADSOIUTE STANDARDS, INC. 800-368-1131 www.absolutestandards.com | | | U | ertified I | Referen | ce Mate | Certified Reference Material CRM | C | 1117 | | • | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | ANAB ISO 17034 Accredited AR-1539 Certificate Number ttps://Absolutestandards.com | ccredited Number ards.com |
|--|---|---------------------------------------|------------------------|---|-----------|------------------------|----------------------------------|-------------------------|--|------------|---|--|---|---------------------------------|
| הבמדובובה אובותווד מרמסמד. | | | | | | | 4 | | 20 | 2 | | | | |
| CENTIFIED WEIGHT NET ON | <u>57038</u> 031524 | | | Solvent: | | 24002546 | Nitric Acid | | | | 1 | | | |
| Description: | Strontium (Sr) | (Sr) | | | 700 | | Nitrio Acid | | Comulated Bur | N Dr. | Boncon Chan | to manual state | 031504 | |
| Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): | 031527 Ambient (20 °C) 1000 | ŝ | | | | | Nume Acid | | | apy. | Denson crian | La | 120100 | |
| NIST Test Number: | 6UTB | | 5E-05 B | 5E-05 Balance Uncertainty | uinty | | | | Reviewed By: | By: | Pedro L. Rentas | as | 031524 | |
| Weight shown below was diluted to (mL): Lot <u>Compound</u> RM# Number | Is diluted to (mL): Lot RM# Number | 2000.07 Nominal Conc. (µg/mL) | 0.100 Purity (%) | 0.100 Flask Uncertainty Purity Uncertainty Assay (%) Purity (%) (%) | say () | Target Weight (g) V | Actual Weight (g) C | Actual Conc. (µg/mL) | Expanded Uncertainty +/- (µg/mL) | CAS | SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LDS | SDS Information Safety Info. On Attachee SHA PEL (TWA) | d pg.) LDSO | NIST |
| 1. Strontium nitrate (Sr) | IN017 SRZ022018A1 | 1000 | 68.997 | 0.10 | 41.2 4.8 | 4.85470 | 4.85502 | 1000.1 | 2.0 | 10042-76-9 | NA | orl-ra | ori-rat >2000mg/kg 3153a | 3153a |
| 5.0E6 | - | 14.495 sec]:58138.D# [Count] [Linear] | ec]:581 | 38.D#[| Count | [Linear | | | | | | | | |
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| 5.0E6 | 110 120 | 130 | 0 | 40 | 150 | Q | 160 | 170 | | 180 | 180 | 000 | | |
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| oart # 57038 Lot # 031524 | | | | | Ť | 1 of 2 | | | | Pri | Printed: 6/7/2024, 3:58:42 PM | 4, 3:58:42 F | Wo | |

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



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

| | | | | | | | Trace M | letals | Verification | ation | by ICP-MS | | (ng/mL) | | | | | | |
|----|-------|----|--------|----------|-------------------|---------------|-------------------|--------|-------------------|----------|--------------|--------------|--|--|----------------------|-----------|---|----------------|----------------|
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| | | | | | | | | | (1) = 1 angle (| get ana. | iyre | | | | | | | | |

Physical Characterization:

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

Certified by:

Sur ?

* 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).

1. P 5 * 1980 246 196 **4**• . 12 M 8: 2 1.481¥ *:

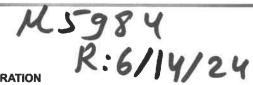
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P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

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% |
| CERTIFIED VALUES | |

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 |

- 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.

Calculated NIST SRM Lot Number: 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_{CRWRM}, where two or more methods of characterization are used is the weighted 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:
 - $w_i = (1/u_{char})^2 / (\Sigma (1/(u_{char})^2))$

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

- k = coverage factor = 2
- $u_{char} = [\Sigma((w_i)^2 (u_{char} i)^2)]^{1/2}$ where $u_{char} i$ are the errors from each characterization method
- u_{bb} = bottle to bottle homogeneity standard uncertainty u_{its} = long term stability standard uncertainty (storage)
- uts = transport stability standard uncertainty (stor
- als assister subsity surraise atternal

4.0 TRACEABILITY TO NIST

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:

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

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k ($u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts}$)^{1/2} k = coverage factor = 2 u_{char a} = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = transport stability standard uncertainty

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

| М | Ag | < | 0.004600 | М | Eu | | 0.009037 | М | Na | | 0.086360 | М | Se | < | 0.005200 | М | Zn | | 0.030125 |
|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| М | A | | 0.014862 | 0 | Fe | | 0.002410 | М | Nb | < | 0.000570 | ο | Si | | 0.024100 | 0 | Zr | < | 0.002600 |
| М | As | < | 0.003500 | м | Ga | < | 0.000570 | м | Nd | | 0.000923 | М | Sm | | 0.000461 | | | | |
| М | Au | < | 0.001700 | м | Gd | < | 0.003500 | М | Ni | < | 0.005700 | М | Sn | < | 0.002300 | | | | |
| 0 | в | | 0.002209 | м | Ge | < | 0.005200 | М | Os | < | 0.001200 | М | Sr | < | 0.004600 | | | | |
| 0 | Ва | < | 0.002500 | М | Hf | < | 0.000570 | n | Р | < | | М | Та | < | 0.000570 | | | | |
| 0 | Be | < | 0.001400 | М | Hg | < | 0.000570 | М | Pb | | 0.005020 | м | Tb | | 0.001044 | | | | |
| М | Bi | < | 0.003500 | М | Но | | 0.009037 | М | Pd | < | 0.005100 | М | Те | < | 0.002300 | | | | |
| 0 | Ca | | 0.009841 | Μ | In | < | 0.002300 | М | Pr | < | 0.002300 | М | Th | < | 0.000570 | | | | |
| М | Cd | < | 0.000570 | М | Ir | < | 0.000570 | М | Pt | < | 0.000570 | М | Ti | < | 0.003500 | | | | |
| М | Се | < | 0.002300 | 0 | к | | 0.018677 | м | Rb | < | 0.000570 | М | TI | < | 0.000570 | | | | |
| М | Со | < | 0.000570 | М | La | | 0.000461 | М | Re | < | 0.000570 | М | Tm | < | 0.003500 | | | | |
| М | Cr | < | 0.004000 | 0 | Li | < | 0.009300 | М | Rh | < | 0.008000 | М | U | < | 0.000570 | | | | |
| М | Cs | < | 0.000570 | М | Lu | | 0.000582 | М | Ru | < | 0.000570 | М | V | | 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 | Y | < | | | | | |
| 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 <u>Terms and Conditions of Sale</u>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 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 HCI dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCI 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 | Се |
| ICP-OES 377.433 nm | 0.005 / 0.0009 µg/mL | 1 | Ta, Th |
| | | | |

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General 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 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**

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Mayn menny Mayyni Kh Paul R Laina

Certifying Officer:

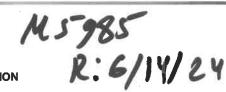
Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis

Refine your results. Redefine your industry.

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



2.0 PRODUCT DESCRIPTION

| Product Code: | Single Analyte Custom Grade Solution |
|---------------------------|--------------------------------------|
| Catalog Number: | 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% |
| CERTIFIED VALUES AN | ID UNCERTAINTIES |

| Certified Value: | 10022 ± 30 μg/mL |
|------------------|--|
| Density: | 1.044 g/mL (measured at 20 \pm 4 °C) |

Assay Information:

3.0

| 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_{CRMRM}, 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 $(u^2_{char} + u^2_{bb} + u^2_{1ts} + u^2_{ts})^{1/2}$ k = coverage factor = 2 $u_{char} = [2((w_i)^2 (u_{char} i)^2)]^{1/2}$ where u_{char} i are the errors from each characterization method

- $\begin{array}{l} \text{construction} \quad \text{con$
- uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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:

$$\begin{split} \chi_{CRM/RM} = (X_n) \, (u_{cher\ n}) \\ \chi_n = mean\ of\ Assay\ Method\ A\ with \\ u_{cher\ n} = the\ standard\ uncertainty\ of\ characterization\ Method\ A \end{split}$$

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²_{cher} a + u²_{bb} + u²_{Hs} + u²_{ts})^½ k = coverage factor = 2 u_{char} a = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty u_{fts} = long term stability standard uncertainty (storage) u_{tt} = transport stability standard uncertainty

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

| М | Ag | < | 0.000760 | Μ | Eu | < | 0.000760 | 0 | Na | | 0.012771 | М | Se | < | 0.023000 | М | Zn | < | 0.006100 |
|---|----|---|----------|---|------|---|----------|---|----|---|----------|---|----|---|----------|---|----|---|----------|
| М | AI | | 0.003385 | 0 | Fe | | 0.004462 | М | Nb | < | 0.000760 | 0 | Si | | 0.024619 | М | Zr | < | 0.000760 |
| М | As | < | 0.004600 | М | Ga | < | 0.000760 | М | Nd | < | 0.000760 | М | Sm | < | 0.000760 | | | | |
| М | Au | < | 0.002300 | М | Gd | < | 0.000760 | 0 | Ni | < | 0.005100 | М | Sn | < | 0.000760 | | | | |
| 0 | в | | 0.003692 | М | Ge | < | 0.001600 | М | Os | < | 0.000760 | 0 | Sr | < | 0.000610 | | | | |
| М | Ba | < | 0.001600 | М | Hf | < | 0.000760 | n | Р | < | | М | Та | < | 0.000760 | | | | |
| 0 | Be | < | 0.000130 | М | Hg | < | 0.003100 | М | Pb | | 0.001400 | М | Tb | < | 0.000760 | | | | |
| Μ | Bi | < | 0.000760 | М | Ho | < | 0.000760 | Μ | Pd | < | 0.001600 | М | Те | < | 0.000760 | | | | |
| 0 | Ca | | 0.004616 | 5 | In | < | | М | Pr | < | 0.000760 | М | Th | < | 0.000760 | | | | |
| Μ | Cd | < | 0.000760 | М | lr – | < | 0.000760 | М | Pt | < | 0.000760 | 0 | Π | < | 0.001100 | | | | |
| М | Се | < | 0.000760 | 0 | к | | 0.007078 | М | Rb | < | 0.000760 | М | TI | < | 0.000760 | | | | |
| М | Со | < | 0.000760 | М | La | < | 0.000760 | М | Re | < | 0.000760 | M | Tm | < | 0.000760 | | | | |
| 0 | Cr | < | 0.001300 | 0 | Li | < | 0.000130 | М | Rh | < | 0.000760 | м | U | < | 0.000760 | | | | |
| М | Cs | < | 0.000760 | М | Lu | < | 0.000760 | М | Ru | < | 0.000760 | М | V | < | 0.001600 | | | | |
| М | Cu | < | 0.003800 | 0 | Mg | | 0.000707 | n | s | < | | М | W | < | 0.001600 | | | | |
| М | Dy | < | 0.000760 | 0 | Mn | | 0.000149 | М | Sb | < | 0.000760 | М | Y | < | 0.000760 | | | | |
| М | Er | < | 0.000760 | М | Мо | < | 0.002300 | М | Sc | < | 0.000760 | Μ | Yb | < | 0.000760 | | | | |
| | | | | | | | | | | | | | | | | | | | |

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

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at $20^\circ \pm 4^\circ$ 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 - 114.82 +3 6 ln(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 HCI / HNO3); Oxide (Soluble in mineral acids); Ores (Carbonate fusion in Pt0 followed by HCI dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in dilute HCI).

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

| Technique/Line | Estimated D.L. | Order | Interferences (underlined indicates severe) |
|--------------------|--------------------|-------|---|
| ICP-MS 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 Callbration 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

- 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

DJ 78

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

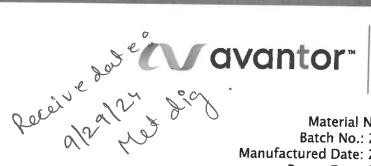


1 of 1



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







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

Certificate of Analysis

| Test | Specification | Result |
|---|---------------|-------------|
| ACS – Assay (as HCI) (by acid-base titrn) | 36.5 - 38.0 % | 37.6 % |
| ACS – Color (APHA) | ≤ 10 | 5 |
| ACS – Residue after Ignition | ≤ 3 ppm | < 1 ppm |
| ACS - Specific Gravity at 60°/60°F | 1.185 - 1.192 | 1.190 |
| ACS – Bromide (Br) | ≤ 0.005 % | < 0.005 % |
| ACS – Extractable Organic Substances | ≤ 5 ppm | < 1 ppm |
| ACS – Free Chlorine (as Cl2) | ≤ 0.5 ppm | < 0.5 ppm |
| Phosphate (PO4) | ≤ 0.05 ppm | < 0.03 ppm |
| Sulfate (SO4) | ≤ 0.5 ppm | < 0.3 ppm |
| Sulfite (SO3) | ≤ 0.8 ppm | 0.3 ppm |
| Ammonium (NH4) | ≤ 3 ppm | < 1 ppm |
| Trace Impurities – Arsenic (As) | ≤ 0.010 ppm | < 0.003 ppm |
| Trace Impurities – Aluminum (Al) | ≤ 10.0 ppb | 0.8 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 3.0 ppb |
| Trace Impurities – Barium (Ba) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Beryllium (Be) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Bismuth (Bi) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Boron (B) | ≤ 20.0 ppb | < 5.0 ppb |
| Trace Impurities – Cadmium (Cd) | ≤ 1.0 ppb | < 0.3 ppb |
| Trace Impurities ~ Calcium (Ca) | ≤ 50.0 ppb | 14.9 ppb |
| Trace Impurities – Chromium (Cr) | ≤ 1.0 ppb | < 0.4 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 1.0 ppb | < 0.3 ppb |
| Trace Impurities - Copper (Cu) | ≤ 1.0 ppb | < 0.1 ppb |
| Trace Impurities – Gallium (Ga) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Germanium (Ge) | ≤ 3.0 ppb | < 2.0 ppb |
| Trace Impurities - Gold (Au) | ≤ 4.0 ppb | 0.2 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | < 50 ppb |
| Trace Impurities – Iron (Fe) | ≤ 15 ppb | 6 ppb |
| | | |

>>> Continued on page 2 >>>

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





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

| Test | Specification | Result |
|--|----------------|-----------|
| Trace Impurities – Lead (Pb) | ≤ 1.0 ppb | < 0.5 ppb |
| Trace Impurities – Lithium (Li) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Magnesium (Mg) | ≤ 10.0 ppb | 0.8 ppb |
| Trace Impurities – Manganese (Mn) | ≤ 1.0 ppb | < 0.4 ppb |
| Trace Impurities – Mercury (Hg) | ≤ 0.5 ppb | 0.1 ppb |
| Trace Impurities – Molybdenum (Mo) | ≤ 10.0 ppb | < 3.0 ppb |
| Trace Impurities - Nickel (Ni) | \leq 4.0 ppb | < 0.3 ppb |
| Trace Impurities – Niobium (Nb) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Potassium (K) | ≤ 9.0 ppb | < 2.0 ppb |
| Trace Impurities – Selenium (Se), For Information Only | | < 1.0 ppb |
| Trace Impurities – Silicon (Si) | ≤ 100.0 ppb | 1.0 ppb |
| Trace Impurities – Silver (Ag) | ≤ 1.0 ppb | < 0.3 ppb |
| Trace Impurities – Sodium (Na) | ≤ 100.0 ppb | 0.7 ppb |
| Trace Impurities – Strontium (Sr) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Tantalum (Ta) | ≤ 1.0 ppb | < 0.9 ppb |
| Trace Impurities – Thallium (TI) | ≤ 5.0 ppb | < 2.0 ppb |
| Trace Impurities – Tin (Sn) | ≤ 5.0 ppb | < 0.8 ppb |
| Trace Impurities – Titanium (Ti) | ≤ 1.0 ppb | 0.2 ppb |
| Trace Impurities - Vanadium (V) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Zinc (Zn) | ≤ 5.0 ppb | 0.8 ppb |
| Trace Impurities – Zirconium (Zr) | ≤ 1.0 ppb | < 0.1 ppb |
| | | |

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

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





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

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

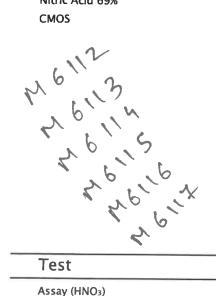
For Laboratory, Research, or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications Storage Condition: Store below 25 °C.

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

James Techier

Jamie Ethier Vice President Global Quality

Nitric Acid 69% CMOS



Receive: a/2a/21 net dig



Material No.: 9606-03 Batch No.: 24B1362001 Manufactured Date: 2024-01-25 Retest Date: 2029-01-23 **Revision No.: 0**

Certificate of Analysis

| Test | Specification | Result |
|-----------------------------------|---------------|-------------|
| Assay (HNO3) | 69.0 ~ 70.0 % | 69.6 % |
| Appearance | Passes Test | Passes Test |
| Color (APHA) | ≤ 10 | 5 |
| Residue after Ignition | ≤ 2 ppm | < 1 ppm |
| Chloride (Cl) | ≤ 0.08 ppm | < 0.03 ppm |
| Phosphate (PO4) | ≤ 0.10 ppm | < 0.03 ppm |
| Sulfate (SO4) | ≤ 0.2 ppm | < 0.2 ppm |
| Trace Impurities – Aluminum (Al) | ≤ 40.0 ppb | < 1.0 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 2.0 ppb |
| Trace Impurities – Barium (Ba) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Beryllium (Be) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Bismuth (Bi) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities - Boron (B) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Cadmium (Cd) | ≤ 50 ppb | < 1 ppb |
| Trace Impurities - Calcium (Ca) | ≤ 50.0 ppb | < 0.2 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 30.0 ppb | < 1.0 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Copper (Cu) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities - Gallium (Ga) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Germanium (Ge) | ≤ 20 ppb | < 10 ppb |
| Trace Impurities - Gold (Au) | ≤ 20 ppb | < 5 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | < 50 ppb |
| Trace Impurities – Iron (Fe) | ≤ 40.0 ppb | < 1.0 ppb |
| Trace Impurities – Lead (Pb) | ≤ 20.0 ppb | < 10.0 ppb |
| Trace Impurities – Lithium (Li) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb | < 1 ppb |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb | < 1.0 ppb |
| Trace Impurities – Nickel (Ni) | ≤ 20.0 ppb | < 5.0 ppb |

>>> Continued on page 2 >>>





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

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

Nitric Acid 69% CMOS





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

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

For Microelectronic Use

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



Sr. Manager, Quality Assurance

Nitric Acid 69% CMOS





R ->10/13/24 Metolig

M6120

Material No.: 9606-03 Batch No.: 2310662003 Manufactured Date: 2023-08-21 Retest Date: 2028-08-19 **Revision No.: 0**

Certificate of Analysis

| Test | Specification | Result |
|-----------------------------------|---------------|-------------|
| Assay (HNO3) | 69.0 - 70.0 % | 69.5 % |
| Appearance | Passes Test | Passes Test |
| Color (APHA) | < 10 < | 10 |
| Residue after Ignition | ≤ 2 ppm | < 2 ppm |
| Chloride (Cl) | ≤ 0.08 ppm | < 0.08 ppm |
| Phosphate (PO4) | ≤ 0.10 ppm | < 0.10 ppm |
| Sulfate (SO4) | ≤ 0.2 ppm | 0.2 ppm |
| Trace Impurities – Aluminum (Al) | ≤ 40.0 ppb | < 40.0 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 5.0 ppb |
| Trace Impurities – Barium (Ba) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities - Beryllium (Be) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities – Bismuth (Bi) | ≤ 20.0 ppb | < 20.0 ppb |
| Trace Impurities - Boron (B) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities – Cadmium (Cd) | ≤ 50 ppb | < 50 ppb |
| Trace Impurities – Calcium (Ca) | ≤ 50.0 ppb | < 50.0 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 30.0 ppb | 30.0 ppb |
| Trace Impurities – Cobalt (Co) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities - Copper (Cu) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities - Gallium (Ga) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities – Germanium (Ge) | ≤ 20 ppb | < 20 ppb |
| Trace Impurities - Gold (Au) | ≤ 20 ppb | < 20 ppb |
| Heavy Metals (as Pb) | ≤ 100 ppb | < 100 ppb |
| Trace Impurities – Iron (Fe) | ≤ 40.0 ppb | < 40.0 ppb |
| Trace Impurities - Lead (Pb) | ≤ 20.0 ppb | < 20.0 ppb |
| Trace Impurities – Lithium (Li) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities – Magnesium (Mg) | ≤ 20 ppb | < 20 ppb |
| Trace Impurities – Manganese (Mn) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities – Nickel (Ni) | ≤ 20.0 ppb | < 20.0 ppb |

Avantor



Material No.: 9606-03 Batch No.: 2310662003

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

Nitric Acid 69% CMOS





Material No.: 9606-03 Batch No.: 2310662003

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

For Microelectronic Use

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



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Hydrochloric Acid, 36.5-38.0% BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis





R->10/13/24

Met dig

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

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|---|---|---|---|---|
| _ | _ | - | | |

Certificate of Analysis

| Test | Specification | Result |
|---|---------------|---------|
| ACS - Assay (as HCI) (by acid-base titrn) | 36.5 - 38.0 % | 37.6 |
| ACS – Color (APHA) | <= 10 | 5 |
| ACS – Residue after Ignition | <= 3 ppm | 1 |
| ACS - Specific Gravity at 60°/60°F | 1.185 - 1.192 | 1.190 |
| ACS – Bromide (Br) | <= 0.005 % | < 0.005 |
| ACS – Extractable Organic Substances | <= 5 ppm | 1 |
| ACS - Free Chlorine (as Cl2) | <= 0.5 ppm | < 0.5 |
| Phosphate (PO4) | <= 0.05 ppm | < 0.03 |
| Sulfate (SO4) | <= 0.5 ppm | < 0.3 |
| Sulfite (SO3) | <= 0.8 ppm | 0.3 |
| Ammonium (NH4) | <= 3 ppm | < 1 |
| Trace Impurities - Arsenic (As) | <= 0.010 ppm | < 0.003 |
| Trace Impurities - Aluminum (Al) | <= 10.0 ppb | < 0.2 |
| Arsenic and Antimony (as As) | <= 5 ppb | < 3 |
| Trace Impurities – Barium (Ba) | <= 1.0 ppb | < 0.2 |
| Trace Impurities – Beryllium (Be) | <= 1.0 ppb | < 0.2 |
| Trace Impurities – Bismuth (Bi) | <= 10.0 ppb | < 1.0 |
| Trace Impurities – Boron (B) | <= 20.0 ppb | < 5.0 |
| Trace Impurities - Cadmium (Cd) | <= 1.0 ppb | < 0.3 |
| Trace Impurities – Calcium (Ca) | <= 50.0 ppb | 29.7 |
| Trace Impurities – Chromium (Cr) | <= 1.0 ppb | < 0.4 |
| Trace Impurities – Cobalt (Co) | <= 1.0 ppb | < 0.3 |
| Trace Impurities – Copper (Cu) | <= 1.0 ppb | < 0.1 |
| Trace Impurities – Gallium (Ga) | <= 1.0 ppb | < 0.2 |

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone: 610.386.1700

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

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

For Laboratory, Research or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications

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

James Techie Jamie Ethier Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone: 610.386.1700

| Part # 58111 | | | | | t. | | | 1. Sodium | Compound | CERTIFIED Nominal C | Absolute (800-368-1131 www.absolute |
|---------------------------------|-------------|-----|-------|----------|-----------------|---------------------|--------------------------------------|---------------------|--|---|--|
| | m/z-> | N.5 | m/z-> | N.5 6 | m/z->₂ 5.0E6 | N 01 01 03 | 5.0E5 | Sodium nitrate (Na) | ind | CERTIFIED WEIGHT REPORT: Part Number: S8111 Lot Number: Lot Number: 122223 Sodium (Description: Sodium (Expiration Date: 122226 Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL): | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
| Lot # 122223 | 210 | | 110 | | 10 | | [1] Spectrum No.1 | INO | RM# | <u>AHT REPORT:</u> Part Number: Lot Number: Description: Description: Expiration Date: rended Storage: tration (µg/mL): ST Test Number: ST Test Number: Shown below was di | d s, Inc. om |
| | | | | | | | 'um No.1 | IN036 NAV01201511 | Lot 1# Number | 58111 122223 Sodium (Na) 12226 Ambient (20 °C) 10000 6UTB 6UTB | |
| | N N O | | 120 | | N. O | | 8.935 | 1 10000 | Nominal Conc. (µg/mL) | . 20 °C) 3000.4 | R |
| | 230 | | 130 | | а О | | 5 sec]:581 | 99.999 0 | Purity (%) | Solvent 2% 5E-05 Balance Uncertainty 0.06 Flask Uncertainty | 01103 |
| | N40 | | 140 | | 6 | | 11.D# [Co | 0.10 26.9 | Uncertainty Assay Purity (%) (%) | Solvent: 2% Balance Uncertainty Flask Uncertainty | ertified Re โ2น |
| 1 of 2 | N O | | 150 | | 0 O | | 8.935 sec]:58111.D# [Count] [Linear] | 111.5406 | Target Weight (g) | | Certified Reference Material CRM ううとね Mらえのん Mら |
| | N 60 | | 100 | | 8 | | ar] | 111.5479 10 | Actual / Weight (g) Conc | Nitric Acid | terial CRM らいまる |
| | | | 170 | | 70 | | | 10000.7 2 | Exp Actual Unco Conc. (µg/mL) +/- | | 408 |
| | | | 180 | | 80 | | | 20.0 7631-99-4 | Expanded Uncertainty (So +/- (µg/mL) CAS# | Alach Formulated By: Kerviewed By: | ~ |
| Printed: 1 | | | 1900 | | 80 | | | | Solvent Safet # OSHA | Ped | |
| Printed: 12/29/2023, 2:56:20 PM | | | | | | | | 5 mg/m3 | SDS Information (Solvent Safety Info. On Attached pg.) AS# 0SHA PEL (TWA) LD50 | Brady | ANAE AR-1 https:// |
| 56:20 PM | | | 200 | | 100 | | | ori-rat 3430 mg/kg | n ttached pg.) سی | 122223 | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |
| | | | | | | | | /kg 3152a | SRM | | 4 Accreditec ate Number ndards.com |

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| Printed: 12/29/2023 2:56:20 PM | Printed: 12/2 | | | | | 2 of 2 | | | | | | | 2223 | Lot # 122223 | | # 58111 | Part # |
|--|---|--|--|---|---|---|--|---|---|---|--|---|--|---|--|---|------------|
| | r sed in | 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). | nts unless oth ity raw materi e to NIST (see the Uncertaint , D.C. (1994). | ements purity ; eable to ing the gton, D. | The certified value is the concentration calculated from gravimetric and volumetric measureme Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest puri 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 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 t Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, | and the and the ith weig ated. atory co atory co flice, | The certified value is the concentration calculated from gravimetric and volume Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with w Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating a Measurement Result," NIST Technical Note 1297, U.S. Government Printing Offi | avimetri ass A g are cali are cali ppropria ernmen | from gra rated Cl ior to us ces that lue, unle under a J.S. Gov | ulated er, calib er, calib er, calib er, calib g baland g baland g baland ght and ght and 1297, L | tion calc zed wat ally usin ally usin araps tio al Note | ncentra ards. meticule 0.5% c 0.5% c lor, B.N Technic | The certified value is the concentration calculated from gravi Purified acids, 18.2 megohm deionized water, calibrated Clas the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that ar Standards are certifed (+/-) 0.5% of the stated value, unless All Standards should be stored with caps tight and under app Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin Measurement Result," NIST Technical Note 1297, U.S. Gover | value i s, 18.2 ion of e prepa e certifi e certifi Referen it Result | certified preparat preparat dards ar dards ar dards ar tandards suremen | * The * Purif * All s * Stan Mea: | |
| Certified by: | e e | | | | | | | standard. | on of this | reparati | ed in the j | ts observ | Physical Characterization: Homogeneity: No heterogeneity was observed in the preparation of this standard. | o heterog | Physical Characterization: Homogeneity: No heterogeneity v | Physi Homog | |
| | - | | | | alyte | (T) = Target analyte | = (T) | | | | | | | | | | |
| 2 2 × 3 < c * | 40.02 40.02 17 40.02 17 17 17 17 17 17 17 17 17 17 | Ta Sr | | | 402 402 402 402 402 402 402 402 402 402 | P P OS NN | | Man Lu Mag | 4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 | 양 다 다 타 H H | 4 4 4 4 4 4 5 8 8 8 8 8 8 | e e e e e e e | 40.02 40.02 40.02 40.02 | 5 S C C S S S | 40.02 40.02 40.02 40.02 | Bi Bi | |
| | | | (ua/ml) | ומ | rometry (ICP-MS): Verification by ICP-M | ry (ICP | | ass Spect Metals | asma Ma Trace | pled Pla | aly Cou | ductiv | sis by In | Analys | umenta | Instra | |
| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | * | | | al CRM | Certified Reference Material C | ference | tified Re | Cen | | | | | s, Inc. | ards.con | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | Absolute (800-368-1131 www.absolute | 800 WWW |

| | 1.057 | 2.0年7 | m/z-> | р. С. С. С. | 5.0E5 | 7/2-> | N 0 0 | 5.0E5 | 1. Antimony (Sb) | Compound | Volume shown below was diluted to (mL): | NIST Test Number: | Recommended Storage: Nominal Concentration (µg/mL): | Expiration Date: | Part Number: Lot Number: Description: | CERTIFIED WEIGHT REPORT: | 800-368-1131 www.absolutestandards.com |
|---|-------|-------|-------|----------------------|-------|-------------------------|-------------|---------------------------------------|--------------------|--|---|---------------------|--|-------------------|---|--------------------------|--|
|) | | | 110 | | | 10 | | [1] Spectrum No.1 | 58151 | Part Number | lip sam mo | ber | nL): | ate: | on: | | |
| | | | 12. | | | NO | | 40.1 | 1 100923 | Lot r Number | uted to (mL) | 6UTB | Ambient (20 °C) 1000 | 120526 | 57051 120523 Antimony (Sb) | | |
| | | | | | | | | | 0.1000 | Dilution Factor | : 3000.41 | | 20 °C) | | w (Sb) | | Ri |
| | | | 130 | | | 30 | | 39C]:58 | 300.0 | Initial Vol. (mL) | | 5E-05 | | | | | Certifi (0 1) 03 (2 4 |
| : | | | 140 | | | 4 0 | | 051.D# | 0.084 | Uncertainty) Pipette (mL) | | Balance Uncertainty | | | | ł | Certified |
| | | | 1 80 | | | 50 | | 17.964 sec]:58051.D# [Count] [Línear] | 1000 | Nominal | unty | rteintv | | 2.0% | 24002546 | Lot # | Certified Reference Material CRM (芝り MS802 Mら |
| | | | | | | Ö | | _(near] | 10001.4 | Initial) Conc. (µg/ml | | | | (mL) | Nitric Acid | Solvent: | nce Material |
| | | | 180 | | | 80 | | | 1000.0 | Final nL) Conc. (µg/mL) | | | | Nitric Acid | | | CRM |
| | | | 170 | | | 70 | | | 0 2.1 | Expanded Uncertainty mL) +/- (µg/mL) | | Reviewe | K | id Formulated By: | | | UU UU |
| | | | 180 | | | 80 | | | 7440-36-0 | Ĕ | an of | | 20 | ited By: | Ferre | | |
| | | | 190 | | | 0 | | | | Solvent Sa CAS# OSH/ | | Pertr | the second | Lawr | and b | | V |
| | | | | | | A. and A. and A. and A. | | | 0.5 mg/m3 | SDS Information nt Safety Info. On Attac OSHA PEL (TWA) | | o I Rentas | SA) | Lawrence Barry | De | | Alv AR https |
| | | | 200 | | | 100 | | | orl-rat 7000 mg/kg | SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50 | | | | | | | ANAB ISO 1:/034 Accreated AR-1539 Certificate Number https://Absolutestandards.com |
| | | | | | | | | |) mg/kg 3102a |) NIST | 120020 | 120523 | | 120523 | | | tificate l standar |

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



Certified Reference Material CRM



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

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

| | | | | | | | HACE M | etais | Verifica | CION | DY ICP-M | 2 (1) | g/mL) | | | | | | |
|-----|-----------|----|--------------|-----|----------------|-----|--------------|--------|----------|------|--------------|-------|----------------|----------------|-------|-----|------------|------|-------------------------|
| 2 | 4002 | 24 | 20.02 | 2 | 000 | 117 | | | | | | 10000 | | | | | ALL MARKEN | 1000 | No. of Concession, Name |
| 2 | 2010 | 5 | 20.02 | Ŋ | 20.02 | H | 40.02 | 5 | <0.02 | N | 40.02 | 7 | A)02 | ŝ | 40.2 | Ţ | 000 | W | 88 |
| Sb | - | ç | 3 | Ţ | 3 | u, | 3 | 4 | 2 | 1 | | 1 | and the second | | 10.4 | 10 | 20.02 | W | 20.02 |
| • | 1 | ş | 10.5 | 1 | 20.02 | 0FL | 2002 | L | 20.02 | NB | 40.02 | R | 200 | 5 | 40.02 | 7 | 200 | = | 3 |
| AS | 6 | ç | 40.02 | E | 40.02 | 5 | | Ņ | 100 | ? | 3 | į | | | | | | | |
| D, | 3 | Ş | 5 | 2 | | | | Gwan C | two | Ş | 2000 | N | 20.02 | Ag | <0.02 | T | 40.02 | < | A.02 |
| ţ | 10.02 | ç | 20.02 | g | 20.02 | - | 40.02 | Mn | 40.02 | Z | 40.02 | 2 | 40.02 | N ² | 3 | ţ | 3 | 5 | 3 |
| Be | <u>80</u> | ç | A .22 | 3 | 3 | ţ1 | 2 | 9 | 2 | , | | | | 1 | | 101 | 20.02 | 11 | 20.05 |
| ą | \$ | 2 | | 1 | and the second | | 101 | Sar | 6.4 | • | 20.05 | Ku | <0.02 | ģ | <0.02 | þ | 40.02 | Y | 202 |
| 101 | 20.02 | S | 20,02 | ନ୍ତ | 40.02 | 5 | 40.02 | Mo | 4022 | 7 | 2003 | Â | 33 | 0 | - | 2 | 2 | 1 | |
| B | 402 | 6 | 8 | An | 23 | Ż | 3 | | | ; | | - | 10 Mar | 0 | 20.02 | 20 | 20:02 | 20 | 40.02 |
| F | to to the | | TURN | 1 | 70.02 | 10 | 20.02 | NQ | 20.02 | K | A 012 | 8 | 40.02 | Ţ | 40.02 | 3 | 20.02 | 2 | 3 |

(T) = Target analyte

Physical Characterization:

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

Certified by:

In P. S.

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

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

the preparation of all standards.

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

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

Part # 57051 Lot # 120523

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

Part # 57047 Lot # 122823

1 of 2

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

| | | | | | | | I ACE ME | VIELAIS | Venilcau | | DY ICP-I | NO (| hg/mL) | | | | | | |
|----|-------|---|-------------|-----|---------------------------|----|------------|---|----------|---------|---------------------------|------|--|-----------|-------|----|-----------------|----|-------|
| | | | The station | | Contraction in the second | | 12 3 2 201 | 18 - 19 - 19 - 19 - 19 - 19 - 19 - 19 - | | 2 KU 1 | With a light of the light | 1.12 | 140 10 10 10 10 10 10 10 10 10 10 10 10 10 | No. | | | States - States | | |
| A | <0.02 | Q | <0.02 | Dy | <0.02 | Hf | <0.02 | Γ. | <0.02 | N | <0.02 | 7 | <0.02 | Se | <0.2 | ТЪ | <0.02 | W | <0.02 |
| SP | <0.02 | Q | <0.2 | 막 | 40.02 | Но | <0.02 | Lu | <0.02 | Ŋ | <0.02 | Re | <0.02 | <u>[2</u> | <0.02 | F | <0.02 | d | <0.02 |
| As | 40.2 | ĉ | <0.02 | 臣 | <0.02 | In | <0.02 | Mg | <0.01 | <u></u> | <0.02 | Rh | <0.02 | Å | Т | H | <0.02 | < | <0.02 |
| Ba | <0.02 | S | <0.02 | R | <0.02 | Ħ | <0.02 | Mn | <0.02 | Pd | <0.02 | Rb | <0.02 | Na | <0.2 | ħ | <0.02 | YЪ | <0.02 |
| Be | <0.01 | Ω | <0.02 | ନ୍ମ | <0.02 | Fe | <0.2 | Hg | <0.2 | P | <0.02 | Ru | <0.02 | ş | <0.02 | Ta | <0.02 | ¥ | <0.02 |
| Bi | <0.02 | S | <0.02 | ନ୍ଚ | <0.02 | 5 | <0.02 | Mo | <0.02 | P | <0.02 | Sm | <0.02 | Ś | <0.02 | Sn | <0.02 | 7 | <0.02 |
| 8 | <0.02 | 5 | <0.02 | Au | <0.02 | Pb | <0.02 | Nd | <0.02 | K | <0.2 | % | <0.02 | Ta | <0.02 | Ð | <0.02 | 2 | <0.02 |

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

(T)= Target analyte

Physical Characterization:

Certified by:

In & She

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Part # 57081 Lot # 062724

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| Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

| | E | χđ | 10 | i ș | Re | Ba | 2 | > | Sb | A | | T | |
|--|-------|-----------|-------|-------|----------------|-------------|-------|-------|--------|-------|---|----------|----------|
| | | <002 | 20.02 | 0.01 | 100- | A0.02 | 20.2 | 2 | 2002 | 20.02 | | | |
| | | 2 | S | 2 | ç | ĉ | Ę | ? (| ç | ß | | | |
| | 10.01 | 50 | <0.02 | 70.02 | 200 | <0.02 | 20.05 | | 502 | <0.02 | | | |
| | 20 | <u>۸.</u> | ନ୍ଚ | Ga | ? | ଜୁ | E | 1 [| ų | Dy | | | |
| | 70.07 | 23 | <0.02 | 20.02 | 3 | <0.02 | 20.02 | 20.02 | 500 | <0.02 | The second se | | |
| | 10 | P | Ľ | не | 1 | 7 | In | DIT. | 5 | Hf | | | |
| | 20.02 | 3 | A0.02 | <0.2 | 10101 | 2003 | <0.02 | 20.05 | 3 | <0.02 | | Tace M | - |
| | NO | | Mo | ВH | | Š | Mg | Ľ | 1 | 5 | Superior of | | ADtolo |
| 9 | 20.02 | | A0.03 | <0.2 | 10.02 | 505 | <0.01 | <0.02 | 3 | <0.02 | WINDER HURSE | VEINICA | Varifina |
| | Ĕ | 1; | Ş | ď | 2 | 2 | õ | No | í | N. | | | |
| | 40.2 | 10.01 | 30 | <0.02 | 20.02 | 2 | <0.02 | 20.02 | | 40.02 | 100 m 100 m | by icr- | |
| | Sc | 011 | 2 | Ru | N | ļ | R | Re | 1 | Ŗ | | N CIM | No 1 |
| | <0.02 | 20.02 | 3 | <0.02 | 20.05 | 2 | <0.02 | <0.02 | a cion | 50.02 | | nd/ uur) | |
| | Ta | G | 0 | Sr | Na | 5 | Ag | S | Ş | 2 | And a state of the | | |
| | <0.02 | 20.02 | 2 | <0.02 | 202 | | <0.02 | A0.02 | 101 | 5 | | | |
| | Ξ | NO. | 2 | ī | Ш. | | - | Te | | | | | |
| | 40.02 | 20.02 | 2 | 40.02 | <0.02 | Þ | -1 | <0.02 | 70.02 | 500 | COLUMN TWO AND ADDRESS OF THE OWNER. | | |
| 10 10 10 10 10 10 10 10 10 10 10 10 10 1 | Zr | 20 | 9 | × | Υ _β | - | < | c | | | | | |
| | <0.02 | 40.02 | | 40.02 | 40,02 | 20.02 | 3 | 40.02 | <0.02 | 5 | | | |

(I) = Target analyte

Physical Characterization:

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

Ser P. S.

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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| Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | | Part Number: 57023 Lot Number: 062424 Description: Vanadium (V) | Expiration Date: 062427 | | vas dilut | Part Lot Dilution | Compound Number Number Factor | [1] Spectrum No.1 [34.243 2.0E6 | | m/z->- 10 20 | 2.067 | 1.027 | m/z->- 110 120 1 | 2.588 | |
|--|----------|---|-------------------------|---------------------|-------------------|---|-------------------------------|---------------------------------------|--|---------------|-------|-------|------------------|-------|-----|
| B . S Ce | | | | 5E-05 | | n Initial | Vol. (mL) | 3 580]:58(| | 00 | | | 130 | | |
| Certified Reference Material CRM 冬瓜 プレリ | | | | Balance Uncertainty | Flask Uncertainty | Uncertainty | Pipette (mL) Conc. (µg/mL) | 34.243 sec]:58023.D# [Count] [Linear] | | A 0 | | | 140 | | 240 |
| ference M | Lot # | 24002546 | 2,0% | Ż | | Nominal | | ount) [Lin | | 50 | | | 150 | | 250 |
| laterial CR | Solvent: | Nitric Acid | 40.0 (mL) | | | Initial | Conc. (µg/mL) | ear] | | 80 | | | 160 | | 260 |
| M M6021 | - | | Nitric Acid | | | Final | Conc. (µg/mL) | | | 70 | | | 170 | | |
| | | Allea | Formulated By: | Reviewed Rv: | | Expanded | +/- (µg/mL) | | | 1 7 1 | | | | | |
| | | Alleah & Brack | | to Je | | (Solvent | CAS# | | | 80 | | | 180 | | |
| http://www.a | | Apro | Aleah O'Brady | Pedro I. Rentas | | SDS Information Safety Info. On Atta | OSHA PEL (TWA) | | | 80 | | | 190 | | |
| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | | | 062424 | 062424 | | SDS Information (Solvent Safety Info. On Attached pg.) | A) LD50 | | | 100 | | | 200 | | |
| Accreditec e Number fards.com | ų | | <u> </u> | - | Ľ | NIST | SRM | | | | | | | | |

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Lot # 062424

Part # 57023





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

| | | 8 | 10 | ä | Be | Da | ç | As | . 5 | <i>ç</i> | A | | ALC: NO. | | |
|----------------------|--------|-------|----------|-------|-------|-------|-------|---|---|----------|-------|--|----------|----------|---|
| (T) = Target analyte | | 40.02 | 70.05 | 3 | 4001 | 20.02 | 3 | A01/2 | 10.02 | 3 | 20.02 | 2 | | | |
| | | ß | |) (| Ş | ç | ? | ຂ | 5 | ; | 8 | | | | |
| | ALVIN. | 203 | 20.02 | | 203 | 20.05 | 2 | 88 | 7.02 | 5 | 40.02 | | | | |
| | 200 | An | ç | | ş | G | 2 | P | 2 | <u>,</u> | Dy | | | | |
| | 70.02 | 3 | <0.02 | 20,02 | 23 | <0.02 | | 20.02 | <u.uz< td=""><td>2</td><td><0.02</td><td>CONTRACTOR OF TAXABLE</td><td></td><td></td><td></td></u.uz<> | 2 | <0.02 | CONTRACTOR OF TAXABLE | | | |
| | L ro | P | La | 14 | p | 5 | | 3' | но | ; | Hf | | | | |
| | 20.02 | 3 | A0.02 | 7.02 | 5 | 40.02 | | 33 | 40.02 | | A.02 | | | I race M | |
| | Na | | Mo | 20 | 11 | Mn | GTAT | Ă | E | • | 5 | | | etals | • |
| | 20.02 | | 40.02 | 202 | \$ | 40.02 | 10.01 | 5 | 40.02 | | 40.02 | Contraction of the owner owner owner owner own | | Ventica | |
| | ŗ | 1 | 7 | • | , | P | Ş | ç | y | 1 | N | A BULLEY | | tion | |
| | 40.2 | | 40.02 | <0.02 | | 422 | 20.02 | 3 | <0.02 | | 2003 | いいまたのための | | | |
| | Sc | Ê | Sm | Ru | ' ; | Rb | K | Ż | Re | | Ŗ | | 5-0 | S (Inc | 1 |
| | 40.02 | 10.04 | 33 | <0.02 | | 40.02 | 20.02 | 2 | -0.02 | 10.04 | con | State of the state | fame of | | - |
| | Ta | ζ | <i>^</i> | ş | | Ş | Ag | | ŝ | č | 20 | | | | |
| | <0.02 | 70.02 | 3 | 40.02 | 10.40 | \$ | AU.02 | 5 | A.02 | 7.01 | 202 | | | | |
| | П | JHC . | ç | Ta | 111 | ţ | Н | | F | 10 | | In the other particular of | | | |
| | <0.02 | 20.02 | 3 | <0.02 | 10.02 | 3 | <0.02 | | 40.02 | <0.0Z | 2 | AND STATISTICS IN STATISTICS | | | |
| | 27 | 20 | 4 | Y | οŤ | Ş | V | | = | W | | CONCINENCIAL DISTU | | | |
| | <0.02 | 20.02 | 3 | <0.02 | 20.02 | 3 | | and the second se | 4000 | <0.02 | | Concernment of the second | | | |

Physical Characterization:

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

In P. Sur

Certified by:

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

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