

Prep Standard - Chemical Standard Summary

 Order ID :
 Q1223

 Test :
 Metals CLP MS, Metals CLP MS FULL

Prepbatch ID : PB166384,PB166570,

Sequence ID/Qc Batch ID: LB134522,LB134612,

Standard ID :

MP82128,MP84041,MP84042,MP84043,MP84044,MP84045,MP84046,MP84047,MP84048,MP84049,MP84050,MP84050,MP84052,MP84052,MP84053,MP84055,MP84056,MP84057,MP84073,MP84074,MP84099,MP84118,MP84119,MP84297,MP84317,MP84318,

Chemical ID :

M5288,M5289,M5295,M5298,M5304,M5472,M5476,M5496,M5497,M5498,M5513,M5516,M5519,M5658,M5697,M5739,M5751,M5768,M5798,M5799,M5800,M5801,M5802,M5806,M5815,M5816,M5817,M5819,M5820,M5873,M5874,M596 1,M5962,M5976,M5977,M5978,M5981,M5983,M5993,M5994,M5999,M6021,M6023,M6025,M6028,M6030,M6032,M60 40,M6055,M6121,M6126,M6127,M6128,M6146,W3112,



| Recipe ID 641 | NAME 1:4 HCL | <u>NO.</u> MP82128 | <u>Prep Date</u> 09/03/2024 | Expiration Date 02/08/2025 | Prepared By Janvi Patel | <u>ScaleID</u> None | <u>PipetteID</u> None | Sarabjit Jaswal |
|---------------------|----------------------------------|-----------------------|--------------------------------|----------------------------------|-------------------------------|------------------------|--------------------------|-----------------|
| <u>FROM</u> | 1500.00000ml of W3112 + 500.0000 | ו 0ml of M604 | i = Final Qu | antity: 2000.000 |) ml | I <u></u> | | |
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| Recipe | | | | Expiration | Prenared | | | 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> | PipettelD | Sarabjit Jaswal |
| 169 | 1:1HNO3 | <u>MP84041</u> | 01/14/2025 | 07/14/2025 | Eman Mughal | None | None | , |
| | | | | | | | | 01/16/2025 |
| FROM | 1250.00000ml of M6126 + 1250.000 | 00ml of W31 | 12 = Final Q | uantity: 2500.0 | 00 ml | | | |
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| Recipe ID 1122 FROM | NAME ICPMS CALIB BLANK(S0/ICB/CCB) 25.00000ml of M6121 + 4925.00000ml | <u>NO.</u> <u>MP84042</u> nl of W3112 | Prep Date 01/14/2025 2 + 50.00000m | | Prepared By Sarabjit Jaswal Final Quantity: 5 | ScaleID None | PipettelD METALS_PIP ETTE_3 (A) | Supervised By Mohan Bera 01/16/2025 |
|------------------------------------|--|---|--|---|--|-----------------------------------|---------------------------------------|---|
| <u>Recipe</u> <u>ID</u> 3947 | <u>NAME</u> S7(SFAM,6020,200.8) | <u>NO.</u> MP84043 | Prep Date 01/14/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | PipetteID METALS_PIP ETTE_3 (A) | Supervised By Mohan Bera 01/16/2025 |
| <u>FROM</u> | 1.00000ml of M5476 + 1.00000ml of of M5976 + 10.00000ml of M5978 + + 4.00000ml of M6032 + 4.90000ml 830.60000ml of W3112 + 9.00000ml 9.90000ml of M5806 + 9.90000ml of | 10.00000ml of M5298 + of M5751 + | of M6126 + 2 4.90000ml of 9.00000ml of | .00000ml of M M5519 + 5.000 M5819 + 9.000 | 5815 + 2.00000n 00ml of M6121 · | nl of M5817 + 4 + 50.00000ml c | 4.00000ml of M of M5304 + | |



Metals STANDARD PREPARATION LOG

| <u>Recipe</u> <u>ID</u> 3948 | NAME S6(SFAM,6020,200.8) | <u>NO.</u> MP84044 | Prep Date 01/14/2025 | | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | PipettelD METALS_PIP ETTE_3 (A) | 01/16/2025 |
|------------------------------------|------------------------------------|------------------------------|--------------------------------|----------------------------------|---|------------------------|---------------------------------------|------------|
| <u>FROM</u> | 0.50000ml of M6121 + 1.00000ml of | M6126 + 48 | 3.50000ml of V | N3112 + 50.000 | 000ml of MP840 | 43 = Final Qua | antity: 100.000 | ml |
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| <u>Recipe</u> <u>ID</u> 3949 | <u>NAME</u> S5(SFAM,6020,200.8) | <u>NO.</u> <u>MP84045</u> | <u>Prep Date</u> 01/14/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | PipettelD METALS_PIP | |

| | | | | | | | ETTE_3 (A) | 01/16/2025 |
|-------------|-----------------------------------|------------|----------------|----------------|----------------|-----------------|-----------------|------------|
| <u>FROM</u> | 0.50000ml of M6121 + 1.00000ml of | M6126 + 73 | 3.50000ml of \ | W3112 + 25.000 | 000ml of MP840 |)43 = Final Qua | antity: 100.000 | ml |
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| Recipe ID 3954 | <u>NAME</u> S4(SFAM,6020,200.8) | <u>NO.</u> MP84046 | Prep Date 01/14/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | |
|----------------------------|------------------------------------|-----------------------|-------------------------|----------------------------------|---|------------------------|--|------------------------------------|
| FROM | 0.50000ml of M6121 + 1.00000ml of | M6126 + 86 | 5.00000ml of V | V3112 + 12.50(| 000ml of MP840 | 43 = Final Qua | antity: 100.000 | ml |
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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> Mohan Bera |

| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | PipettelD | Mohan Bera |
|-----------|-----------------------------------|----------------|----------------|---------------|-----------------|----------------|-----------------|------------|
| 3951 | S3(SFAM, 6020,200.8) | <u>MP84047</u> | 01/14/2025 | 02/07/2025 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 01/16/2025 |
| FROM | 0.50000ml of M6121 + 1.00000ml of | M6126 + 88 | 3.50000ml of V | W3112 + 10.00 | 000ml of MP840 | 44 = Final Qua | antity: 100.000 | ml |
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| Recipe ID 3955 | NAME S2CONC(SFAM,6020,200.8) | <u>NO.</u> MP84048 | Prep Date 01/14/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | PipettelD METALS_PIP ETTE_3 (A) | |
|----------------------|---|--|--|--|--|--|--|--------------------------------|
| FROM | 0.05000ml of M5476 + 0.05000ml of of M5981 + 0.05000ml of M5983 + 0. 0.05000ml of M6128 + 0.10000ml of of M5298 + 0.25000ml of M5799 + 0. 0.25000ml of M6021 + 0.50000ml of of M5519 + 2.50000ml of M5806 + 2. = Final Quantity: 250.000 ml | 05000ml of M5496 + 0. 25000ml of M6032 + 2. | M6023 + 0.09 10000ml of M M5819 + 0.29 00000ml of M | 5000ml of M602 5658 + 0.10000 5000ml of M590 5815 + 2.00000 | 25 + 0.05000ml 0ml of M5751 + 62 + 0.25000ml 0ml of M5817 + | of M6028 + 0.0 0.10000ml of M of M5976 + 0.2 2.50000ml of M | 5000ml of M60 15802 + 0.2500 5000ml of M59 15498 + 2.5000 | 330 + 90ml 978 + 90ml |

| <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> Mohan Bera |
|----------------------------|-----------------------------------|----------------|---------------------|--------------------|------------------------------|----------------|--------------------------|------------------------------------|
| 3956 | S2(SFAM,6020,200.8) | <u>MP84049</u> | 01/14/2025 | 02/07/2025 | Sarabjit Jaswal | None | METALS_PIP ETTE_3 (A) | |
| FROM | 0.50000ml of M6121 + 1.00000ml of | M6126 + 98 | 1 3.00000ml of V | V3112 + 0.500 | Doml of MP8404 | 8 = Final Quar | | |
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| <u>Recipe</u> <u>ID</u> 3957 | <u>NAME</u> S1(SFAM,6020,200.8) | <u>NO.</u> MP84050 | <u>Prep Date</u> 01/14/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | <u>PipettelD</u> METALS_PIP ETTE_3 (A) | Supervised By Mohan Bera 01/16/2025 |
|------------------------------------|------------------------------------|-----------------------|--------------------------------|----------------------------------|---|------------------------|--|---|
| FROM | 0.50000ml of M6121 + 1.00000ml of | M6126 + 88 | 50000ml of V | V3112 + 10.000 | 000ml of MP840 | 49 = Final Qua | ntity: 100.000 | ml |
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| Recipe | | | | Expiration | Prepared | | | Supervised By |

| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | PipettelD | Mohan Bera |
|-----------|-----------------------------------|----------------|--------------|-----------------|-----------------|----------------|--------------------------|------------|
| 3958 | ICV(SFAM) | <u>MP84051</u> | 01/14/2025 | 02/07/2025 | Sarabjit Jaswal | None | METALS_PIP ETTE_3 (A) | 01/16/2025 |
| FROM | 2.00000ml of M5295 + 98.00000ml o | f MP84042 | = Final Quan | tity: 100.000 n | י <u>י</u> ו | | | |
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| Recipe ID 3961 | NAME CCV | <u>NO.</u> MP84052 | Prep Date 01/14/2025 | | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | Supervised By Mohan Bera 01/16/2025 |
|----------------------|--|--|---|---------------------------------|---|-----------------------------------|--|---|
| FROM | 0.20000ml of M5513 + 0.50000ml of of M5815 + 1.00000ml of M5817 + 10 M6032 + 24.95000ml of M5498 + 24. + 4.50000ml of M5819 + 4.50000ml of 830.60000ml of W3112 = Final Quar | 0.00000ml of 95000ml of of M6128 + | of M6126 + 12 M5806 + 24.9 4.95000ml of | .45000ml of M8 95000ml of M6 | 5298 + 12.45000 127 + 25.00000r | oml of M5519 + nl of M5304 + 4 | 2.00000ml of 4.50000ml of M | |

| <u>Recipe</u> <u>ID</u> | NAME | <u>NO.</u> | Prep Date | Expiration Date | <u>Prepared</u> <u>By</u> | <u>ScaleID</u> | <u>PipettelD</u> | Supervised By |
|----------------------------|----------------------------------|----------------|---------------|--------------------|------------------------------|----------------|------------------|---------------|
| <u>1142</u> | ICSA ICPMS | <u>MP84053</u> | 01/14/2025 | | Sarabjit Jaswal | None | METALS_PIP | Mohan Bera |
| | | | | | | | ETTE_3 (A) | 01/16/2025 |
| FROM | 10.00000ml of M5873 + 90.00000ml | of MP84042 | 2 = Final Qua | ntity: 100.000 | ml | | | |
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| <u>Recipe</u> <u>ID</u> 1143 | NAME ICSAB ICPMS | <u>NO.</u> MP84054 | Prep Date 01/14/2025 | | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | |
|------------------------------------|----------------------------------|-----------------------|-------------------------|--------------|---|------------------------|--|--|
| FROM | 10.00000ml of M5873 + 10.00000ml | of M5874 + | 80.00000ml c | of MP84042 = | Final Quantity: 1 | 00.000 ml | | |
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| <u>Recipe</u> | | | | Expiration | Prepared | | | Supervised By |
|---------------|-----------------------------------|----------------|--------------|-------------------|-----------------|----------------|------------|---------------|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | PipetteID | Mohan Bera |
| 3962 | MG 10PPM FOR TUNE | <u>MP84055</u> | 01/14/2025 | 02/07/2025 | Sarabjit Jaswal | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 01/16/2025 |
| FROM | 0.01000ml of M6127 + 9.99000ml of | MP84042 = | Final Quanti | ty: 100.000 ml | | | | |
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| Recipe ID 3894 FROM | NAME TUNE 200PPB 2.00000ml of M6055 + 2.00000ml of | <u>NO.</u> <u>MP84056</u> MP84055 + | Prep Date 01/14/2025 96.00000ml d | | Prepared By Sarabjit Jaswal Final Quantity: 1 | ScaleID None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | Supervised By Mohan Bera 01/16/2025 |
|------------------------------|--|---|---|----------------------------------|--|------------------------|--|---|
| Recipe ID 3903 | NAME ISS 3PPM | <u>NO.</u> <u>MP84057</u> | Prep Date 01/14/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | Supervised By Mohan Bera 01/16/2025 |



| Recipe ID 2902 | NAME S8 ICPMS | <u>NO.</u> MP84073 | <u>Prep Date</u> 01/14/2025 | Expiration Date 02/07/2025 | Prepared By Janvi Patel | <u>ScaleID</u> None | PipetteID None | Supervised By Mohan Bera 01/16/2025 |
|----------------------|---|-----------------------|--------------------------------|----------------------------------|-------------------------------|------------------------|-------------------|---|
| FROM | 1.00000ml of M5496 + 2.50000ml of of M6127 + 79.00000ml of MP84042 | | | |)ml of M5497 + | 5.00000ml of M | 5806 + 5.0000 | lÕml |
| Recipe ID | NAME | NO. | Prep Date | Expiration Date | Prepared By | <u>ScaleID</u> | PipettelD | Supervised By |

| Recipe | | | | Expiration | Prepared | | | Supervised By |
|-----------|-----------------------------------|----------------|--------------|----------------|---------------|----------------|-----------------|-----------------|
| <u>ID</u> | NAME | <u>NO.</u> | Prep Date | Date | <u>By</u> | <u>ScaleID</u> | PipetteID | Sarabjit Jaswal |
| 870 | ICPMS SPIKE SOL.B | <u>MP84074</u> | 01/16/2025 | 02/07/2025 | Janvi Patel | None | METALS_PIP | |
| | | | | | | | ETTE_3 (A) | 01/17/2025 |
| FROM | 0.45000ml of M5962 + 5.00000ml of | M5993 + 5. | 00000ml of M | 5999 + 39.5500 | 0ml of MP8404 | 2 = Final Quar | ntity: 50.000 m | I |
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| <u>Recipe</u> <u>ID</u> 3963 | NAME CONC.LCSW SPIKE | <u>NO.</u> MP84099 | Prep Date 01/16/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Janvi Patel | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | Sarabjit Jaswal |
|------------------------------------|---|--|--|--|--|--|--|---------------------|
| FROM | 0.05000ml of M5472 + 0.05000ml of 1 of M5981 + 0.05000ml of M5983 + 0. 0.10000ml of M5289 + 0.10000ml of 1 of M5819 + 0.25000ml of M5962 + 0. 1.00000ml of M5298 + 1.25000ml of 1 of M5516 + 2.50000ml of M5519 + 2. 250.000 ml | 05000ml of M5658 + 0. 25000ml of M5816 + 1. | M6023 + 0.05 10000ml of M M5978 + 0.25 25000ml of M | 5000ml of M602 5697 + 0.10000 5000ml of M602 5820 + 1.25000 | 25 + 0.05000ml oml of M5802 + 21 + 0.25000ml oml of M6121 + | of M6028 + 0.0 0.25000ml of M of M6128 + 0.5 2.50000ml of M | 5000ml of M60 15799 + 0.2500 0000ml of M60 15497 + 2.5000 | 30 + 0ml 32 + |

| <u>Recipe</u> <u>ID</u> 3964 | NAME CONC.LCSS SPIKE | <u>NO.</u> <u>MP84118</u> | Prep Date 01/21/2025 | | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | PipettelD METALS_PIP ETTE_3 (A) | |
|------------------------------------|--|---|---|--|---|--|--|------------------------------------|
| FROM | 0.25000ml of M5798 + 0.25000ml of of M5983 + 0.25000ml of M6023 + 0 0.50000ml of M5289 + 0.50000ml of of M5799 + 1.25000ml of M5819 + 1 + 12.50000ml of M5519 + 12.50000r 2.50000ml of M6121 + 4.80000ml of of M5820 = Final Quantity: 250.000 | .25000ml of M5658 + 0. .25000ml of nl of M5806 M5476 + 5. | M6025 + 0.25 50000ml of M M5962 + 1.25 + 12.50000m | 5000ml of M602 5751 + 0.50000 5000ml of M59 Il of M6127 + 1 | 28 + 0.25000ml 0ml of M5802 + 78 + 1.25000ml 55.70000ml of V | of M6030 + 0.2 1.00000ml of M of M6021 + 12. V3112 + 2.5000 | 15981 + 0.2500 5000ml of M61 15977 + 1.2500 50000ml of M5 0ml of M6032 |)0ml 28 +)0ml 5498 + |



| Recipe ID 870 | NAME ICPMS SPIKE SOL.B | <u>NO.</u> MP84119 | Prep Date 01/21/2025 | | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | |
|---------------------|--|-----------------------|-------------------------|----------------|---|------------------------|--|---------------|
| FROM | 0.02500ml of M5977 + 0.05000ml of Quantity: 50.000 ml | M5476 + 5. | 00000ml of M | 5994 + 5.00000 |)ml of M5999 + | 39.92500ml of | MP84042 = Fi | nal |
| Recipe | | | | Expiration | Prenared | | | Supervised By |

| <u>Recipe</u> <u>ID</u> 170 | NAME 1:1HCL | <u>NO.</u> MP84297 | Prep Date 01/31/2025 | Expiration Date 02/28/2025 | <u>Prepared</u> <u>By</u> Eman Mughal | <u>ScaleID</u> None | <u>PipetteID</u> None | Sarabjit Jaswal |
|-----------------------------------|----------------------------------|-----------------------|-------------------------|----------------------------------|---|------------------------|--------------------------|-----------------|
| FROM | 1250.00000ml of M6121 + 1250.000 | L DOml of W31 | I12 = Final Q | uantity: 2500.0 | <u>1</u> 00 ml | | | |



| <u>Recipe</u> <u>ID</u> 1883 | NAME SE 10PPM | <u>NO.</u> <u>MP84317</u> | Prep Date 02/02/2025 | Expiration Date 02/07/2025 | <u>Prepared</u> <u>By</u> Sarabjit Jaswal | <u>ScaleID</u> None | <u>PipetteID</u> METALS_PIP ETTE_3 (A) | Supervised By Eman Mughal 02/05/2025 |
|------------------------------------|-----------------------------------|------------------------------|-------------------------|----------------------------------|---|------------------------|--|--|
| <u>FROM</u> | 0.10000ml of M5962 + 9.90000ml of | MP84042 = | - Final Quanti | ty: 10.000 ml | | | | |
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| Recipe ID | NAME | <u>NO.</u> | Prep Date | Expiration Date | Prepared By | ScaleID | PipettelD | Supervised By |

| <u>Recipe</u> | | | | Expiration | Prepared | | | Supervised By |
|---------------|-----------------------------------|----------------|--------------|---------------|-----------------|----------------|-----------|---------------|
| ID | NAME | <u>NO.</u> | Prep Date | <u>Date</u> | <u>By</u> | <u>ScaleID</u> | PipettelD | Eman Mughal |
| 1027 | SB 1PPM | <u>MP84318</u> | 02/02/2025 | 02/07/2025 | Sarabjit Jaswal | None | None | - |
| | | | | | | | | 02/05/2025 |
| FROM | 0.01000ml of M6146 + 9.99000ml of | MP84042 = | Final Quanti | ty: 10.000 ml | | | | |
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| 119 / K, 10000 PPM, | | | Opened By | Received By | Lot # |
|--|--|---|--|--|---|
| 0 ml | 071122 | 07/11/2025 | 09/01/2022 / jaswal | 07/21/2022 / jaswal | M5288 |
| ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| 113 / Aluminum (Al) ,000PPM | 070622 | 07/06/2025 | 09/02/2022 / jaswal | 07/12/2022 / jaswal | M5289 |
| ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| V-1 / ICV (ICP/ICPMS) OCK SOLN | ICV-1014 | 02/05/2025 | 08/07/2024 / jaswal | 04/20/2021 / bin | M5295 |
| | | Expiration | Date Opened / | Received Date / | Chemtech |
| ItemCode / ItemName 126 / Fe, 10000 PPM, | Lot # 020422 | Date 02/04/2025 | Opened By 05/02/2023 / | Received By 06/15/2022 / | Lot # |
| , 0 , 0 | 13 / Aluminum (Al) DOOPPM ItemCode / ItemName -1 / ICV (ICP/ICPMS) DCK SOLN ItemCode / ItemName | 13 / Aluminum (Al) 070622 000PPM 070622 ItemCode / ItemName Lot # -1 / ICV (ICP/ICPMS) ICV-1014 DCK SOLN ICV-1014 ItemCode / ItemName Lot # | ItemCode / ItemName Lot # Date 13 / Aluminum (Al) 070622 07/06/2025 000PPM 070622 07/06/2025 ItemCode / ItemName Lot # Expiration Date -1 / ICV (ICP/ICPMS) ICV-1014 02/05/2025 OCK SOLN Lot # Expiration Date ItemCode / ItemName Lot # Expiration Date | ItemCode / ItemNameLot #DateOpened By13 / Aluminum (AI)07062207/06/202509/02/2022 /000PPM07062207/06/202509/02/2022 /ItemCode / ItemNameLot #Expiration DateDate Opened / Opened By-1 / ICV (ICP/ICPMS)ICV-101402/05/202508/07/2024 /OCK SOLNLot #Expiration DateDate Opened / Opened ByItemCode / ItemNameLot #Expiration DateDate Opened / Opened By | ItemCode / ItemName Lot # Date Opened By Received By 13 / Aluminum (AI) 070622 07/06/2025 09/02/2022 / jaswal 07/12/2022 / jaswal 000PPM 070622 07/06/2025 09/02/2022 / jaswal 07/12/2022 / jaswal ItemCode / ItemName Lot # Expiration Date Opened / Opened By Received Date / Received By -1 / ICV (ICP/ICPMS) ICV-1014 02/05/2025 08/07/2024 / jaswal 04/20/2021 / bin 0CK SOLN Lot # Expiration Date Opened / Opened By Received Date / Received By ItemCode / ItemName Lot # Expiration Date Opened / Opened By 04/20/2021 / bin |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------|---|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | 6020CAL-1 / Calibration Standard Method 6020 | S2-MEB711244 | 10/20/2026 | 08/07/2024 / jaswal | 04/01/2022 / jaswal | M5304 |
| | | | | | | |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57038 / Sr, 1000 PPM, 125 ml | 082922 | 08/29/2025 | 01/14/2025 / Jaswal | 03/16/2023 / jaswal | M5472 |
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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. | 57138 / Sr, 10000 PPM, 125 ml | 082922 | 08/29/2025 | 07/29/2024 /jaswal | 03/16/2023 / jaswal | M5476 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58113 / Al, 10000 PPM, 500 ml | 011623 | 01/16/2026 | 08/15/2023 / jaswal | 03/17/2023 / bin | M5496 |
| 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 | 03/18/2023 / bin | 03/17/2023 / bin | M5497 |
| 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. | 57182 / Pb, 10000 PPM, 125 ml | 061522 | 06/15/2025 | 03/19/2023 / bin | 03/17/2023 / bin | M5513 |
| 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 | 022123 | 11/06/2025 | 11/06/2024 / kareem | 03/17/2023 / bin | M5516 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57119 / Potassium (K) 10,000PPM | 120822 | 12/08/2025 | 01/08/2024 / bin | 03/17/2023 / bin | M5519 |
| 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 # |
| Inorganic Ventures | 6020ISS / 6020ISS, 10 ug/ml, Bi, Ho, In, 6Li, Rh, Sc, TB, Y | T2-MEB709511 | 09/03/2026 | 08/07/2024 / jaswal | 04/11/2022 / jaswal | M5739 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58029 / Cu, 1000 PPM, 500 ml | 071723 | 07/17/2026 | 10/01/2024 / Jaswal | 08/25/2023 / jaswal | M5751 |
| | | - | | | • | |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|----------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 58112 / Mg, 10000 PPM, 500 ml | 091823 | 09/18/2026 | 01/08/2024 / bin | 01/03/2024 / bin | M5768 |
| | | | | | | |



| 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 # |
| 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. | 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 # |
| Absolute Standards, Inc. | 58030 / Zinc, Zn, 500 ml, 1000 PPM | 111623 | 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 Opened / | Received Date / | Chemtech |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|----------|---------------------------------------|-----------------|--------------------|----------------------------|--------------------------------|-------------------|
| EPA | PART A / ICSA (ICPMS) STOCK SOLN | CP-MS ICSA-0803 | 04/30/2025 | 04/17/2024 / jaswal | 07/14/2022 / jaswal | M5873 |
| | | | | | | |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|----------|---|-----------------|--------------------|----------------------------|--------------------------------|-------------------|
| EPA | PART B / ICSB (ICPMS) STOCK SOLUTION | CP-MS ICSB-0803 | 04/30/2025 | 04/17/2024 / jaswal | 07/14/2022 / jaswal | M5874 |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---------------------------------|--------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57028 / Ni, 1000 PPM, 125 ml | 041124 | 04/11/2027 | 07/02/2024 / Jaswal | 06/11/2024 / Jaswal | M5961 |
| | | | | | | |

| 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 # |
|-----------------------|--|-------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | CGMO1-1 / MOLYBDENUM 125mL 1000ug/mL | T2-MO720876 | 07/17/2027 | 08/07/2024 / jaswal | 02/22/2024 / Jaswal | M5976 |

| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------|--|-------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | CGMO1-1 / MOLYBDENUM 125mL 1000ug/mL | T2-MO720876 | 07/17/2027 | 01/16/2025 / JANVI | 02/22/2024 / Jaswal | M5977 |

| 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 |
| U U | | 12-111 13372 | 00,1172021 | | | M5 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 57092 / U, 1000 PPM, 125 ml | 060724 | 06/07/2027 | 07/29/2024 / Jaswal | 06/11/2024 / Jaswal | M5981 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57040 / Zr, 1000 PPM, 125 ml | 071423 | 07/14/2026 | 07/29/2024 / Jaswal | 06/11/2024 / Jaswal | M5983 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CLPP-SPK-4 / SOIL/WATER SPIKE SOLN 4, 125mL | V2-MEB742036 | 03/12/2029 | 10/04/2024 / Jaswal | 02/22/2024 / Jaswal | M5993 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CLPP-SPK-4 / SOIL/WATER SPIKE SOLN 4, 125mL | V2-MEB742036 | 03/12/2029 | 10/04/2024 / Jaswal | 02/22/2024 / Jaswal | M5994 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Inorganic Ventures | CLPP-SPK-1 / SOIL/WATER SPIKE SOLN 1, 125mL | T2-MEB721963 | 07/27/2027 | 09/04/2024 / Jaswal | 02/22/2024 / kareem | M5999 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57023 / V, 1000 PPM, 125 ml | 062424 | 06/24/2027 | 09/28/2024 / jaswal | 08/05/2024 / Jaswal | M6021 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---------------------------------|---------|--------------------|----------------------------|--------------------------------|-------------------|
| Absolute Standards, Inc. | 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. | 57082 / Pb, 1000 PPM, 125 ml | 061224 | 11/09/2026 | 08/05/2024 / Jaswal | 08/05/2024 / Jaswal | M6025 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57048 / Cd, 1000 PPM, 125 ml | 070124 | 07/01/2027 | 08/05/2024 / kareem | 08/05/2024 / Jaswal | M6028 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / 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. | 57056 / Ba, 1000 PPM, 125 ml | 010924 | 01/09/2027 | 01/14/2025 / Jaswal | 08/05/2024 / Jaswal | M6032 |
| | | | | | | |

| 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) | 24D1562005 | 02/08/2025 | 08/09/2024 /janvi | 08/01/2024 / Janvi | M6040 |



| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
|-----------------------------|---|--------------|--------------------|----------------------------|--------------------------------|-------------------|
| Inorganic Ventures | IV-STOCK-12 / ICP-MS TUNING SOLUTION, 125mL | U2-MEB734294 | 06/21/2028 | 08/21/2024 / Jaswal | 08/19/2024 / Jaswal | M6055 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Seidler Chemical | BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L) | 0000275677 | 05/13/2025 | 11/13/2024 / Eman | 10/13/2024 / Eman | M6121 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Seidler Chemical | BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L) | 24D1062002 | 06/03/2025 | 12/03/2024 / Janvi | 11/12/2024 / Janvi | M6126 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58112 / Mg, 10000 PPM, 500 ml | 112124 | 11/21/2027 | 01/13/2025 / kareem | 01/13/2025 / kareem | M6127 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 58025 / Mn, 1000 PPM, 500 ml | 101124 | 10/11/2027 | 01/13/2025 / kareem | 01/13/2025 / kareem | M6128 |
| Supplier | ItemCode / ItemName | Lot # | Expiration Date | Date Opened / Opened By | Received Date / Received By | Chemtech Lot # |
| Absolute Standards, Inc. | 57051 / Sb, 1000 PPM, 125 ml | 071724 | 07/17/2027 | 01/31/2025 / kareem | 10/18/2024 / kareem | M6146 |



284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900, Fax : 908 789 8922

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



Certificate of Analysis M5991 M5992 M5983 M5994

50.00 ± 0.22 µg/mL

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).

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2.0 **PRODUCT DESCRIPTION**

| Product Code: | Multi Analyte Custon | n Grade Solution | |
|----------------------------|------------------------------------|------------------------|---------------------------------------|
| Catalog Number: | CLPP-SPK-4 | | |
| Lot Number: | V2-MEB742036 | | |
| Matrix: | 3% (v/v) HNO3 | | |
| Value / Analyte(s): | 100 μg/mL ea: Antimony, | | |
| | 50 μg/mL ea: Cadmium, | | Thallium, |
| | 40 µg/mL ea: Arsenic, | | |
| | 20 µg/mL ea: Lead, | | |
| | 10 µg/mL ea: Selenium | | |
| CERTIFIED VALUES AI | ND UNCERTAINTIES | 5 | |
| | ERTIFIED VALUE 00.0 ± 0.7 µg/mL | ANALYTE Arsenic, As | CERTIFIED VALUE 40.00 ± 0.26 µg/mL |
| Cadmium, Cd 5 | 0.00 ± 0.22 μg/mL | Lead, Pb | 20.00 ± 0.09 µg/mL |

Selenium, Se

3.0

Density:

1.016 g/mL (measured at 20 ± 4 °C)

Thallium, Ti

 $10.00\pm0.04~\mu\text{g/mL}$

Assay Information:

| ANALYTE | METHOD | NIST SRM# | SRM LOT# |
|---------|------------|-----------|--------------|
| As | ICP Assay | 3103a | 100818 |
| Cd | ICP Assay | 3108 | 130116 |
| Cd | EDTA | 928 | 928 |
| Cd | Calculated | | See Sec. 4.2 |
| Pb | ICP Assay | 3128 | 101026 |
| Pb | EDTA | 928 | 928 |
| Pb | Calculated | | See Sec. 4.2 |
| Sb | ICP Assay | 3102a | 140911 |
| Se | ICP Assay | 3149 | 100901 |
| Se | Calculated | | See Sec. 4.2 |
| TI | ICP Assay | 3158 | 151215 |
| TI | Calculated | | See Sec. 4.2 |
| | | | |

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

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

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

 X_{i} = mean of Assay Method i with standard uncertainty u_{char} i w_{i} = the weighting factors for each method calculated using the inverse square of the variance: $w_{i} = (1/u_{char})^{2} / (\Sigma(1/(u_{char}))^{2})$

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

k = coverage factor = 2

$$\begin{split} & u_{char} = [\overline{\Sigma_i}(w_i)^2 (u_{char_i})^2]^{V_2} \text{ where } u_{char_i} \text{ is re the errors from each characterization method} \\ & u_{bb} = \text{bottle to bottle homogeneity standard uncertainty} \\ & u_{rts} = \text{long term stability standard uncertainty (storage)} \end{split}$$

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

$$\begin{split} & \mathsf{X}_{CRM/RM} = (\mathsf{X}_{a}) \; (\mathsf{u}_{char\ a}) \\ & \mathsf{X}_{a} = \mathsf{mean\ of\ Assay\ Method\ A\ with} \\ & \mathsf{u}_{char\ a} = \mathsf{the\ standard\ uncertainty\ of\ characterization\ Method\ A} \end{split}$$

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k ($u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts}$)^½ k = coverage factor = 2 uchar a = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = tansport 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° \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

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 12, 2024

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

11.2 Lot Expiration Date

- March 12, 2029

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

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

11.3 Period of Validity

- 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:

Joseph Burns Custom VS Manager

Paul R Saine

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis M5991 M5992 M5983 M5994

50.00 ± 0.22 µg/mL

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).

24



2.0 **PRODUCT DESCRIPTION**

| Product Code: | Multi Analyte Custo | m Grade Solution | |
|-------------------------|--------------------------------------|------------------------|---------------------------------------|
| Catalog Number: | CLPP-SPK-4 | | |
| Lot Number: | V2-MEB742036 | | |
| Matrix: | 3% (v/v) HNO3 | | |
| Value / Analyte(s): | 100 µg/mL ea: Antimony, | | |
| | 50 μg/mL ea: Cadmium, | | Thallium, |
| | 40 µg/mL ea: Arsenic, | | |
| | 20 µg/mL ea: Lead, | | |
| | 10 µg/mL ea: Selenium | | |
| CERTIFIED VALUES | AND UNCERTAINTIE | S | |
| ANALYTE Antimony, Sb | CERTIFIED VALUE 100.0 ± 0.7 µg/mL | ANALYTE Arsenic, As | CERTIFIED VALUE 40.00 ± 0.26 µg/mL |
| Cadmium, Cd | 50.00 ± 0.22 μg/mL | Lead, Pb | 20.00 ± 0.09 µg/mL |

Selenium, Se

3.0

Density:

1.016 g/mL (measured at 20 ± 4 °C)

Thallium, Ti

 $10.00\pm0.04~\mu\text{g/mL}$

Assay Information:

| ANALYTE | METHOD | NIST SRM# | SRM LOT# |
|---------|------------|-----------|--------------|
| As | ICP Assay | 3103a | 100818 |
| Cd | ICP Assay | 3108 | 130116 |
| Cd | EDTA | 928 | 928 |
| Cd | Calculated | | See Sec. 4.2 |
| Pb | ICP Assay | 3128 | 101026 |
| Pb | EDTA | 928 | 928 |
| Pb | Calculated | | See Sec. 4.2 |
| Sb | ICP Assay | 3102a | 140911 |
| Se | ICP Assay | 3149 | 100901 |
| Se | Calculated | | See Sec. 4.2 |
| TI | ICP Assay | 3158 | 151215 |
| TÌ | Calculated | | See Sec. 4.2 |
| | | | |

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

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

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

 X_{i} = mean of Assay Method i with standard uncertainty u_{char} i w_{i} = the weighting factors for each method calculated using the inverse square of the variance: $w_{i} = (1/u_{char})^{2} / (\Sigma(1/(u_{char}))^{2})$

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

k = coverage factor = 2

$$\begin{split} & u_{char} = [\overline{\Sigma_i}(w_i)^2 (u_{char_i})^2]^{V_2} \text{ where } u_{char_i} \text{ is re the errors from each characterization method} \\ & u_{bb} = \text{bottle to bottle homogeneity standard uncertainty} \\ & u_{rts} = \text{long term stability standard uncertainty (storage)} \end{split}$$

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

$$\begin{split} & \mathsf{X}_{CRM/RM} = (\mathsf{X}_{a}) \; (\mathsf{u}_{char\ a}) \\ & \mathsf{X}_{a} = \mathsf{mean\ of\ Assay\ Method\ A\ with} \\ & \mathsf{u}_{char\ a} = \mathsf{the\ standard\ uncertainty\ of\ characterization\ Method\ A} \end{split}$$

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k ($u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts}$)^½ k = coverage factor = 2 uchar a = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = tansport 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.

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

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12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Joseph Burns Custom VS Manager

Paul R Saine

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

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

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Certified Reference Material CRM



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

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

| | b | a G | į | ۲ ۲ | Ŗ | As | S | 2 2 | A | | | |
|----------------------|--|-------|-------|--------|-------|----------------|-------|-------|--|----------|----------------|--|
| i di | <u.u2< td=""><td><0.02</td><td>10.01</td><td>5,</td><td>-1</td><td>A 12</td><td><0.02</td><td>20.02</td><td>3</td><td></td><td></td><td></td></u.u2<> | <0.02 | 10.01 | 5, | -1 | A 12 | <0.02 | 20.02 | 3 | | | |
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| | Pb | La | He | | - 1 | 31 | Ho | Hf | | | | |
| | <0.02 | <0.02 | 40.2 | <0.02 | | 3 | <0.02 | 40.02 | COLUMN TRANSPORT | | Trace M | |
| | Nd | Mo | Hg | MIN | 5 | M ₂ | £ | 5 | No. of Concession, Name | 100 | Signat | |
| (T) = Target analyte | <0.02 | <0.02 | 40.2 | <0.02 | 10.01 | 501 | <0.02 | <0.02 | The second second second | | Verifica | |
| get anal | × | P | P | Pd | Ş | ? | Ŋ | R | - and - | 1001 | tion | |
| yte | 40.2 | <0.02 | <0.02 | <0.02 | 20.02 | 3 | <0.02 | <0.02 | 日本のない | | hy ICP- | |
| | Sc | Sm | Ru | Rb | KD | 1 | R | Pr | 11 11 11 11 11 11 11 11 11 11 11 11 11 | 190 | NC / | |
| | <0.02 | <0.02 | <0.02 | <0.02 | 20.02 | | 40.02 | 40.02 | War of the particular | har in r | in /ml / | |
| | Ta | ŝ | ş | Na | Ag | • • | 2 | Se | | | | |
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| | <0.02 | 2013 | 40.02 | <0.02 | A0.02 | 20.02 | | 2003 | NUCCERT OF DESCRIPTION OF | | | |

Physical Characterization:

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

In P. S.

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 57056 Lot # 010924

| 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 ⁶ | | [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: | 15, 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 | hed pg.) NIST LD50 SRM | 070124 | | 070194 | | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |

1 of 2

Part # 57048

Lot # 070124

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

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

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| (T) = Target analyte | <0.02 | 10.02 | 500 | 40.2 | <0.02 | | <0 .01 | <0.02 | | 40.02 | ALL STREET | Vernica | くうどれい |
| let anal | × | 2 | à | ٦ | Pd | ! ! | õ | Nb | | N: | The second second | | +:)) |
| vte | 4012 | 20.02 | 5 | <0.02 | <0.02 | | <0.02 | <0.02 | 10.02 | c0 0> | 一般であるの | | 55 |
| | Sc | 2m | 2 | R | Rb | | R | Re | | ę | | MU C | |
| | 40.02 | 20.02 | 3 | <0.02 | 40.02 | 10.00 | 300 | <0.02 | 10.04 | con | | ug/mL) | |
| | Ta | c, | > | ş | Na | 9.0 | A۵ | 2 | 00 | 2 | SUMPLICATION OF | | |
| | A0,02 | <0.02 | | 40.02 | <0.2 | 10.01 | 33 | <0.02 | 10.4 | 3 | III N SOLVER WILL S | | |
| | H | S | | j | Th | | 3 | Te | 01 | 1 | | | |
| | <0.02 | <0.02 | 10.01 | <h m<="" td=""><td><0.02</td><td>10.02</td><td>3</td><td><0.02</td><td>20.05</td><td>200</td><td></td><td></td><td></td></h> | <0.02 | 10.02 | 3 | <0.02 | 20.05 | 200 | | | |
| | 27 | 20 | ÷ | < | 4 | v | 4 | d | × | | Constant of the | | |
| | <0.02 | <0.02 | 10.01 | 200 | <0.02 | 20.05 | 2 | 40.02 | 20.02 | | State and a state of the state | | |

Physical Characterization:

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

In P. St.

Certified by:

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

- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
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Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

e24

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

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

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

Physical Characterization:

(T)= Target analyte

Certified by:

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

Son P. Shirt

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

- the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
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- * All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

| ADSOIUTE STANDARDS, INC. 800-368-1131 www.absolutestandards.com | com com | | M | 528 | $\mathcal{N}528\% \qquad \text{R: } n7/21/20$ | Referei R | nce Mati | erial CRN | RM 2029 | V | | | ANAB IS AR-153 https://Ab | 80 17034 / 9 Certificat solutestan | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |
|---|--|--|--------------------------|-----------------------|--|--------------|------------------------|-------------------------------|---|--|---------------|--|---|--|--|
| CERTIFIED WEIGHT REPORT Part Lot Des | <u>PORT:</u> Part Number: Lot Number: Description: | <u>58119</u> 071122 Potassium (K) | (Y) | | Solv | Solvent: 20 | Lot # 20510011 | Nitric Acid | 4 | T | l la | 2 | t. | | |
| Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below was | Expiration Date: 071125 Recommended Storage: Ambient (I Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL): | 071125 Ambient (20 °C) 10000 6UTB ed to (mL): 20 | 0 °C) 2000.02 | 5E-05 Ba 0.058 Fil | 29 5E-05 Balance Uncertainty 0.058 Flask Uncertainty | \ 0 | 40.0 (mL) | Nitric Acid | | Formulated By: | | Lawrence Barry | | 071122 | |
| Compound | RM# | Lot Number | Nominal Conc. (µg/mL) | | Uncertainty A Purity (%) | say (%) | Target Weight (g) V | Actual Veight (g) C | Actual Actual Weight (g) Conc. (µg/mL) | Expanded Uncertainty +/- (µg/mL) | (Solv CAS# | SDS Information (Solvent Safety Info. On Attached pg.) CSHA PEL (TWA) LD5(| r mation . On Attache 'WA) | id pg.) LD50 | NIST |
| 1. Potassium nitrate (K) | IN034 | IN034 KD022021A1 | 10000 | 99.999 | 0.10 3 | 37.6 53 | 53.1925 | 53.1934 | 10000.2 | 20.0 | 7757-79-1 | 5 mg/m3 | | orl-rat 3015 mg/kg | [] ⁽¹⁾ |
| 2.066 | [1] Spectrum No.1 | - | 35.763 sec]:581 | ec]:581 | 19.D# [Count] [Linear] | Count] | [Linear | | | | | | | | |
| 1.0 E | | | | | | | | | | | | | | | |
| m/z-> | 0 F | 50 | 30 | | 04 | СЦ Ц | | 00 | 20 | - | O | 00 | 100 | | |
| 1.0E5 | | | | | | | | | | | | | | | |
| m/z-> | 110 | 120 | 130 | | 140 | 150 | 0 | 160 | 170 | ٣ | 180 | 190 | 500 | | |
| 000 | | | | | | | | | | | | | | | |
| <-z/ш | 210 | 520 | 230 | | 240 | 250 | | 260 | | | | | | | |
| rt# 58119 Lot # 071122 | 71122 | | | | | 1 of 2 | | | | | Printe | Printed: 8/2/2022, 11:20:01 PM | 11:20:01 P | Σ | 1 |

Part #

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

| | | | | | | | I Face M | lecals | Veritic | ation | | - N E - | (nd/mL) | | | | | | |
|----|-------|-----|-------|----|-------|---------|----------|--------|---------|-------|-------|------------------|---------|-----|-------|--------|-------|-----|-------|
| | | | | | | | | | | | | | | | | | | | |
| AI | <0.02 | g | <0.02 | Dy | <0.02 | Hf | <0.02 | i. | <0.02 | ïN | <0.02 | Ł | <0.02 | Se | <0.2 | 1P | <0.02 | M | <000> |
| - | <0.02 | Ca | <0.2 | ם | <0.02 | Ho | <0.02 | Lu | <0.02 | Νb | <0.02 | Re | <0.02 | 37 | <0.02 | e L | <0.02 | : = | <0.02 |
| | <0.2 | ပီ | <0.02 | Eu | <0.02 | II | <0.02 | Mg | <0.01 | ő | <0.02 | Rh | <0.02 | AP | <0.0> | F | <0.02 | > | 2007 |
| _ | <0.02 | స | <0.02 | Gd | <0.02 | Ц | <0.02 | Mn | <0.02 | Рd | <0.02 | 4a | 800 | ° N | 607 | ; Ę | 20.02 | 4 | 20.02 |
| | <0.01 | ŋ | <0.02 | ŝ | <0.02 | LT Q | 602 | Нœ | 607 | 2 | 2010 | Å, | 20.02 | | 7.07 | | 70.02 | | 20.02 |
| _ | 000 | ę | 000 | 5 | | | 200 | 2 | 7.02 | - 6 | 20.02 | 2, | 20.02 | 0 | 20.02 | | 70'0> | ł | ≤0.02 |
| - | 20.02 | 3 . | 20.02 | ġ. | 20,02 | Ę. | <0.02 | MO | <0.02 | ť, | <0.02 | ES | <0.02 | s | <0.02 | ES. | <0.02 | Z, | <0.02 |
| - | <0.02 | ī | <0.02 | Αu | <0.02 | Pp | <0.02 | pN | <0.02 | К | F | Sc | <0.02 | Ta | <0.02 | Ξ | <0.02 | Z | <0.02 |

(T)= Target analyte

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.
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1 of 2

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| 800-368-1131 | Absolute Standards, II |
|--------------|------------------------|
| | Inc. |
| | 800-368-1131 |



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

| | | | | | | | race Me | etais | Verifica | ation | by ICP- | MC (| hg/mr) | | | | | | |
|----|-------|----------------|-------|----|-------|----|---------|-------|----------|-------|---------|------|--------|----|-------|----|-------|----------------|-------------|
| | | | | | | | -0110- | | | | | | | | | | | | |
| Al | Т | G | <0.02 | Dy | <0.02 | Hf | <0.02 | Li | <0.02 | Ni | <0.02 | 77 | <0.02 | Se | <0.2 | Ъ | <0.02 | W | <u>6</u> .0 |
| Sр | <0.02 | ß | <0.2 | 막 | <0.02 | Но | <0.02 | Ŀ | <0.02 | Nb | <0.02 | Re | <0.02 | ŝ | <0.02 | Te | 40.02 | | <0.02 |
| As | <0.2 | င့ | <0.02 | Eu | <0.02 | In | <0.02 | Mg | <0.01 | ŝ | <0.02 | Rh | <0.02 | Ag | <0.02 | | 40.02 | V | 4 |
| Ba | <0.02 | ß | <0.02 | Gd | <0.02 | ١r | <0.02 | Mn | <0.02 | Pd | <0.02 | Rb | <0.02 | Na | <0.2 | Þ | <0.02 | Υ γ | 4 |
| Be | <0.01 | Ω | <0.02 | Ga | <0.02 | Fe | <0.2 | Hg | <0.2 | P | <0.02 | Ru | <0.02 | ş | 40.02 | Jm | 40.02 | ¥ | |
| B: | <0.02 | S | <0.02 | Ge | <0.02 | La | <0.02 | Mo | <0.02 | ₽ | <0.02 | Sm | <0.02 | s | <0.02 | 2 | <0.02 | 7 | 4 |
| B | <0.02 | С ¹ | <0.02 | Au | <0.02 | Pb | <0.02 | Nd | <0.02 | × | <0.2 | Ş | <0.02 | Ta | <0.02 | Ħ | <0.02 | 27 | A) |

Physical Characterization:

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

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Certified by:

In P. Mr.

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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"

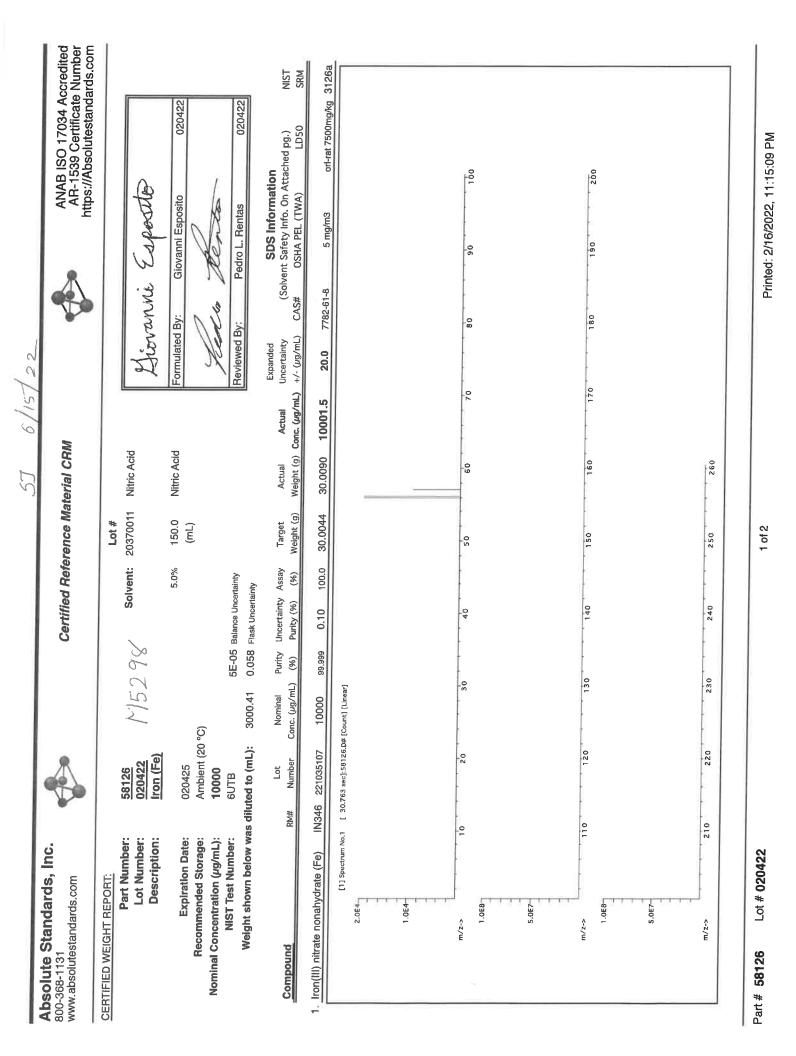
AP11MInstructions for QATS Reference Material: Inorganic ICV SolutionsICV1-1014For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate
into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.ICV5-0415For the cold vapor analysis of mercury by AA, use 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 |



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





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

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

| 000 | 20 | 00.00 | | | | | | | | | ALC: NO | LI LI LI LI LI LI | | The state of the | | | | |
|-------|----|-------|----|-------|----|-------|------|-------|----------|-------|---------|-------------------|----------|------------------|----|-------|--------|-------|
| 70.07 | 3 | 20.02 | ĥ | <0.02 | Ħ | <0.02 | := | <0.02 | ïŻ | <0.10 | k | 000- | 0 | 00 | Ē | | | |
| <0.02 | S | <0.2 | ц, | 2002 | ЦО | 000 | F | | ; ; | | * * | 70.02 | b o | 2.0> | 19 | <0.02 | > | <0.0× |
| 507 | c | 0.00 | i, | 10.04 | 2 | 70.02 | T'I | <0.02 | ٩Ż | <0.02 | Re | <0.02 | 55 | <0.02 | ť | 2007 | 11 | 001 |
| 7.02 | ŋ | <0.02 | 립 | <0.02 | In | <0.02 | Mo | /0.01 | ć | 000 | ē | | | | 2 | 10.02 | > | 20.02 |
| <0.02 | ڒ | 20.02 | 2 | 000 | | | 9 | 10.04 | ŝ | 70.02 | 2 | <0.02 | Ag | <0.02 | Ħ | ≤0.02 | > | <0.0> |
| | 3 | 70.04 | 3 | <0.UZ | 4 | <0.02 | Mn | <0.10 | Ρd | <0.02 | Rh | <0.02 | ٩Ŋ | 102 | É | 200 | | |
| <0.01 | გ | <0.5 | g | <0.02 | Ц. | C 02 | 'n, | | ¢ | | 1 | 1000 | PLT | 7.02 | 97 | <0.02 | Υb | <0.0≻ |
| <0.07 | ξ | 010 | ç | | , | 7.02 | 2112 | 7.02 | <u>ب</u> | <0.02 | 2 | <0.02 | S | <0.02 | Tm | <0.02 | > | 700 |
| 70.02 | 3 | 01.02 | 35 | <0.10 | ę | <0.02 | мо | <0.02 | Ł | <0.02 | mS. | 2007 | U | 200 | 5 | | ۰ I | 20.00 |
| <0.02 | õ | <0.10 | Υn | <0.02 | fd | <0.02 | NA | 20.02 | 1 | | 5 | 70.02 | 2 | 20.02 | Ч | <0.02 | Z Z | ×0.0 |
| | | | | | | | DLT | 20,02 | 4 | 202 | 22 | <0.02 | <u>e</u> | 000 | ï | 2007 | 1 | òç |

Physical Characterization:

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

Certified by:

Sur P

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

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

1.026 g/mL (measured at 20 \pm 4 °C)

Density:

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

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

| Characterization of CRM/RM by Two or More Methods 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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 20, 2021

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

11.2 Lot Expiration Date

- October 20, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

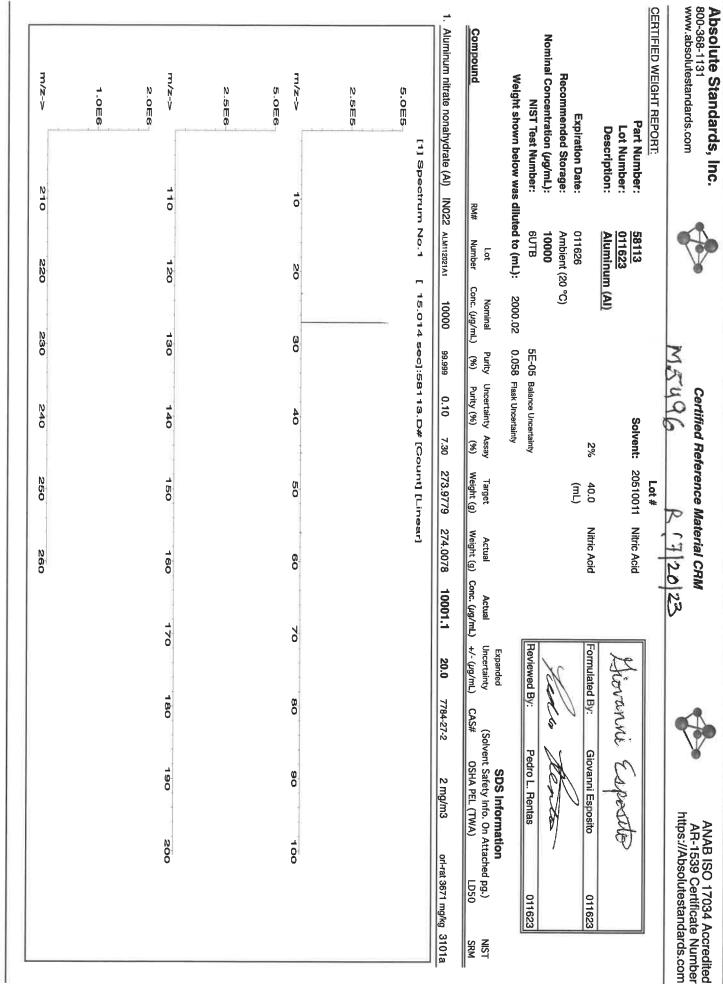
Paul Gaines Chairman / Senior Technical Director

Paul R Line



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| 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.) COSHA PEL (TWA) LD5(COSHA PEL (TWA) onl-rat >2000 | -0 0 | 190 |
| 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 |
| | 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 | ŝ | <0.02 | T. | ≤0.02 | Ę | <0.02 | 2 | 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

| 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 |
| 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 |
| | 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 | H | <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 | 20 .0> | 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 | ያ | 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 | ŝ | <0.02 | T. | ≤0.02 | Ę | <0.02 | 2 | 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. 800-368-1131 www.absolutestandards.com | | | | Certified R | Certified Reference Material CRM | aterial CRI | R 103/17 | H/2 | | AN AF https | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | Accredited ate Number ndards.com |
|--|--|--------------------------|--------------------|--|---------------------------------------|----------------------|-------------------------|--|----------------------|---|--|--|
| CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: | r: <u>57182</u> r: <u>061522</u> n: <u>Lead (Pb</u>) | - | | Solvent: | Lot # It: 20510011 | Nitric Acid | | Lievannie | / nui E | apertite | | |
| Expiration Date:061525Recommended Storage:Ambient (2)Nominal Concentration (ug/mL):10000NIST Test Number:6UTBWeight shown below was diluted to (mL): | e: 061525 e: Ambient (20 °C)): 10000 n: 6UTB rs diluted to (mL): 20 | 0 °C) 2000.02 | 5E-05 B 0.058 F | 2% 5E-05 Balance Uncertainty 0.058 Flask Uncertainty | 2% 40.0 mty (mL) | Nitric Acid | | Formulated By: | | Giovanní Esposito | 061522 | <u>ន</u> នា |
| Compound | Lot RM# : Number | Nominal Conc. (µg/mL) | Purity (%) | Uncertainty Assay Purity (%) (%) | ay Target) Weight (g) | Actual Weight (g) | Actual Conc. (µg/mL) | Expanded Uncertainty +/- (µg/mL) C | Solvent S CAS# 0S | SDS information (Solvent Safety Info. On Attached pg.) COHA PEL (TWA) | tion Attached pg.) LD50 | NIST |
| 1. Lead(II) nitrate (Pb) | IN029 PBD122016A1 | 10000 | 99,999 | 0.10 62.5 | 5 32.0006 | | 10001.1 | | φ | 0.05 ma/m3 | introne | |
| [1] Speci | [1] Spectrum No.1 [| 17.284 s | 90]:58 | 85.D# | 17.284 sec]:58182.D# [Count] [Linear] | (upe | | | | | | 11 |
| ສ ອ ອ | | | | | | | | | | | | |
| 7.2-> 2.0E6 | 20 | O. | | 40 | 80 | Co | 20 | Ö Ø | 0 | * | 100 | |
| 1.0E6 | | | | | | | | | | | | |
| rn/z-> | 110 | 130 | | 140 | 150 | 160 | 170 | 180 | | 0 | 002 | |
| ы С. С. Ш. С. | | | | | | | | | | | | |
| R A E | 210 220 | 530 | | N 0 | 250 | 260 | | | | | | |
| Part # 57182 Lot # 061522 | | | | | 1 of 2 | | | | Printed: 3 | Printed: 3/16/2023, 1:45:32 PM | 45:32 PM | |

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

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

| F | | | | | | | | | | | | | | | | | |
|-----------|---------|----|-------|----|---|-----|-------|------------|--------------|-----|--------------|----|--------------|-----|--------|----|-------|
| | d <0.02 | Ŋ | <0.02 | Hf | <0.02 | Li | <0.02 | in in | <0.02 | đ | 4000 | 3 | C.04 | 14 | WWV | | 000 |
| | | d | 000 | 14 | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | | ; | | : | | 2 | 10 | 10 | 70.02 | * | ZULUS |
| _ | | đ | 20.02 | 2 | | 3 | <0.02 | q | <0.02 | g | 40.02 | ŝ | <u>60.05</u> | Te | \$0.02 | Ŋ | <0.02 |
| 02 ₹07 | ` | đ | <0.02 | 9 | 0.02 | Mg | <0.01 | ő | <0.02 | 4a | <0.02 | Åø | 2007 | F | 200 | 1 | Ş |
| _ | _ | 5 | 2007 | 1 | 200 | 1 | 000 | i | | | | 9 | | 17 | 70.02 | > | 70702 |
| | | 3 | 70.70 | 4 | | UIW | 20'02 | P2 | <0.02 | 2 | 40.02 | Ra | 5 9 9 | đ | ≤0.02 | \$ | 20.02 |
| | _ | g | 0.02 | Ъ. | €02 | Нg | <0.2 | ρ. | 2002 | n d | 2007 | 2 | 2007 | e | 000 | | |
| | _ | Ċ | | , | | | | • | | | 70.00 | 5 | 70.02 | 111 | 70.02 | H | 20102 |
| | | 5 | | ġ | <0.02 | Wo | <0.02 | Z . | <u>6</u> .62 | SB | 40.02 | s | <0.02 | Sn | <000> | Zn | 2007 |
| | | Au | <0.02 | £ | F | 72 | 2007 | 2 | 500 | 0 | ~~~~ | ŧ | | | | 1 | 10.01 |
| | | | | | | | 70.00 | 4 | 10 | 20 | 20.02 | 13 | | q | 8.U2 | 3 | 808 |

Physical Characterization:

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

In P M.

Certified by:

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

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

* 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 # 57182 Lot # 061522

| Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | , Inc. | ¢ | | | Certified | Reference | Certified Reference Material CRM | RM | | 2 | 2 | ANAB ISO 17034 Accredited AR-1539 Certificate Number | 4 Accredited |
|---|--|--|--------------------------|---------------|---|----------------------|----------------------------------|--------------------------|--|---------------|--|--|--------------|
| | | 5 | | | M | SAD . I | (IRW | R Les/ | 101120 | でい | | https://Absolutestandards.com | andards.com |
| CERTIFIED WEIGHT REPORT: Part Number: Lot Number: | ber: ber: | <u>58111</u> 022123 Soding Av | 1 | | Solvent: | Lot # 21110221 | Nitric Acid | | F J | anna an | - China - | t t | |
| Expiration Date: 022126 Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (m1): | Date: "age: "mL): ther: w was dilute | 022126 022126 Ambient (20 °C) 10000 6UTB 6UTB | and c) 2001 41 | 5E-05 0 06 | 2% 5E-05 Balance Uncertainly | 60.0 (mL) | Nitric Acid | | Formulated By: | . \$ | Lawrence Barry | 022123 | |
| Compound | RM# | | Nominal Conc. (µg/mL) | | raak uncertainty Assay Uncertainty Assay Purity (%) (%) | Target Weight (g) | Actual Weight (g) C | Actual Conc. (µg/mi.) | Expanded Uncertainty +/- (ug/mL) | (Solv CAS# | SDS Information ent Safety Info. On Attac OSHA PEL (TWA) | SDS Information Solvent Safety Info. On Attached pg.) | NIST |
| 1. Sodium nitrate (Na) | 1N036 | IN036 NAV01201511 | 10000 | 666.66 | 0.10 26.9 | 111.5406 | 111.5410 | 10000.0 | 20.0 | 7631-99-4 | 5 mg/m3 | ort-rat | 3152a |
| 5.0E倍 | [1] Spectrum No.1 | | 8.935 | 3:[Daa | 8.935 sec]:58111.D# [Count] [Linear] | ount] [Lir | lear] | | | | | o b | |
| 0 10 10 10 10 10 10 10 10 10 10 10 10 10 | | | | | ÷ | | | | | | | | |
| m/≥-> 5.0E6 | 9 | 30 | | 0 | 9 | O a | 0 | 2 | 0 | S | 0.6 | 100 | |
| С 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | | | | | | | | | | | | | |
| m/z-> | 011 | 120 | | 000 | 140 | 150 | 160 | 170 | p | 180 | 190 | 50 | |
| 2.5E6 | | | | | | | | | | | | | _ |
| <-z/ш | 810 0 | 220 | | 630 | 240 | 250 | 260 | | | | | | _ |
| Part # 58111 Lot # 022123 | 123 | | | | | 1 of 2 | | | | | Printed: 3/16/20 | Printed: 3/16/2023, 1:45:29 PM | 1 |

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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 Spectrometry (ICP-MS):

| | <0.02 | B | <0.02 | λ | ≤0.02 | Hf | <0.02 | Ľ | <0.02 | N | <0.02 | 놊 | <0.02 | 3 | €02 | E. | 4002 | M | W W |
|----------|--------|----|-------|-----|--------------|----|--------------|----|-------|----|-------|----|-------|-----|--------------|-----|----------|-----|------|
| Sb Sb | 40.02 | లో | <0.2 | 西 | 40.02 | Н | 40.02 | 2 | <0.02 | ź | <0.02 | æ | <0.0> | 3 | 0.02 | 4 | 40.02 | | 2002 |
| | 402 | ථ | <0.02 | щ | 40.02 | ä | <0.02 | Mg | 100> | ර | <0.02 | Rh | 20.0> | Az | 0 ,02 | F | 2002 | > > | 000 |
| | <0.02 | ථ | <0.02 | 3 | 0.02 | ч | <0.02 | Ma | <0.02 | Pd | <0.0> | R. | <0.02 | e N | F- | Ē | 200 | \$ | |
| _ | 10.0> | ප | <0.02 | පී | 40.02 | Fe | 402 | Hg | 402 | ۵. | <0.02 | Ru | 2002 | ð, | - UU | ļ | WW WW | 2 > | |
| _ | ≤0.02 | ර | <0.02 | ප් | 40.02 | ŗ | <0.02 | Wo | <0.02 | ۶. | 4002 | Ş | <00V> | 1 | | 3 | | - 2 | |
| | \$0.02 | 8 | <0.02 | n¥. | 40.02 | 2 | 40.02 | PN | 4002 | | 40.2 | 3 | | s e | | 5 F | | 5 4 | |

Physical Characterization:

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

Certified by:

2 2

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

the preparation of all standards.

All standard containers are meticulously cleaned prior to use.

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

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

Part # 58119 Lot # 120822

1 of 2

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| | Printed: 3/16/2023, 1:45:22 PM | Printed: 3 | | | | | | 2 of 2 | | | | | | | 0822 | Lot # 120822 | | Part # 58119 | Par |
|--|---|------------|--|---------------------|---|------------------------------|---|--|--|--|---|---|--|--|--|--|--|--|-----|
| | | | | above) of NIS | to NIST (see above). 9 Uncertainty of NIST 9.C. (1994). | le to N the Ur 1, D.C. | Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). | weight d. ry cond i and E: fice, W | ated with ise state laborator valuating rinting Of | e calibr: otherw opriate es for E ment P | Standards are prepared gravimetrically using balances that are calibrated with weights trace 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 Expressi Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washing | balance ed valu t and u it, C.E., 297, U. | Insignation of the standard for the stan | metrica 0.5% of d with (r, B.N. echnica | 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. Govern | e prepa e certifi should leferend t Result | idards an Idards an Idards an Itandards ertainty F Isuremen | * Star * All s Mea | |
| | | | tated. sed in | rwise s Is are u | s unless otherwise stated. raw materials are used in | ents ur rity rav | The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohim deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. | the hi | ind volum sware and | netric a A glas: | om gravir Ited Class | lated fr , calibra | ion calcu ed water | centrat deioniz ds. | The certified value is the concert Purified acids, 18.2 megohim deic the preparation of all standards. All the preparation of all standards. | value is 18.2 I ion of a | certified fied acids preparat | * The * Puri- | |
| | s. | | | | | | | | | | | | | | | | | | |
| | | | | | | | : | : | | | | | ÷ | | | | | | |
| | in P. M. | 1 | | | | | | | | ndard. | Homogeneity: No heterogeneity was observed in the preparation of this standard. | paration | d in the pr | observe | eneity was | heterog | geneity: No | Homo | |
| | Certified by: | | | | | | | | | | | | | | ation: | acteriz | Physical Characterization: | Phys | |
| | | | | | , B | | ulyte | (T) = Target analyte | (T) = Ta | | | | | | œ | | | | |
| 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | 40,02 40,02 40,02 40,02 V 40,02 V V 60,02 V V 60,02 V V S Cr | ᅻᇟᆋᇽᇽᆇᇽ | 4000 12 10 10 10 10 10 10 10 10 10 10 10 10 10 | Ta Sr Na Sr Sr | 44444 88888888888888888888888888888888 | Sch Rate Street | T 22 22 22 22 22 22 22 22 22 22 22 22 22 | K J P Z Q J N | 4 4 4 4 4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 | Mo Nd | 4 4 4 4 4 4 4 8 8 8 8 8 8 8 8 | 월 27 월 4 월 8 표 | 888888888 | <u>ት</u> ዓ ያ ያ ዋ ካ | 40.020 | 58558 <u>5</u> 5 | 40.020 | Al Sb Ba Be Bi Bi | |
| | | | | [] | (µg/mL) | S | Verification by ICP-M | ation | | Metals | Trace M | | | | | | | | |
| | | | | | | | (S): | ICP-M | ometry (| Spectr | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | ed Plas | y Couple | uctive | is by Ind | Analys | umental | Instr | |
| ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | ANAB IS AR-1539 https://Abs | V | | | | CRM | Certified Reference Material CRM | rence | fied Refe | Certi | | | V | | , inc. | dards.con | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | Absolute : 800-368-1131 www.absolute | |

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| 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 (ug/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 | | 」 () () () () () () () () () () | | 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

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| Absolute Standards, Inc. Certified Reference 800-368-1131 Image: Certified Reference www.absolutestandards.com Image: Certified Reference Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | andards.cor | s by Indu | ictive | y Coupled | Plasn | na Mass S | Spectr C | Certified Reference Material Ci | ICP-M | IS): | ateria | I CRM | | | | | ¥ | 크 | ANAB 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 | 323 | 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 10 °C) | | | 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 | ٥ 10 | 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



| | | | | | | | The second secon | ALC: NOT THE OWNER OF THE OWNER OWNER OF THE OWNER OWNER OWNER OWNER OWNER OWNE | TO THE MAN | Contraction of the other | | | | | | | | | |
|---|-------|----|-------|----|-------|----|--|---|------------|--------------------------|-------|----|-------|----------|-------|-----|-------|-----|-------|
| | <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 | д | 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 F | | 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).

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

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

Lot # 071723

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| 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 |

1 of 2

3

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

| 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 | Ho | <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



1 of 2

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



| | | | | | | | Trace M | letals | Verification | Ition | by ICP-MS | | (ng/mL) | | | | | | | _ |
|----|-------|---|---|----|-------|----|---------|-------------|--------------|--|----------------|------------|---------|----|------------------------------|---------|--------------|----|---|----|
| | | and the second se | A CONTRACTOR OF A CONTRACTOR | | | | | All and the | The share of | The second s | ALL DAY STREET | 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 | <0.02 | 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 (µg/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 | | | | |
| A)2 C C | | 2 2 2 2 2 2 2 | 40.02 Ni | | 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 # 24002546 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 02 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 Cobait (C 091926 Recommended Storage: Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): COTB NIST Test Number: COTB CODAIT (C) Part (C) CODAIT (C) C) CODAIT (C) C) C) C) C) C) C) C) C) C) | 1. Cobatt(II) nitrate hexahydrate (Co) 58 | | <pre>Part # 57027 Lot # 091923</pre> |

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

Certified Reference Material CRM



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

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

| L | 200 | 10 | 2 Contraction | 4 | 2000 | | 400 | | | - | | 4 | | | | | | | |
|---|-------|----|---------------|----|---------------|----|-------------|----|-------------------|----|--------------|----|--------------|----|--------------|----|-------|----|--------------|
| | 20.05 | 3 | 20.05 | 5 | 20.02 | Ħ | 40.02 | 3 | <0.02 | ż | 40.02 | £ | 40.02 | 8 | 40.2 | f | ₫.02 | M | 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 | లి | ≤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 | ي. | ≪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

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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 m B |
| | 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 |

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Certified Reference Material CRM



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

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

(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.

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

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

Part # 57033 Lot # 111323

| $\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 30.0 772.751 5mg/r 12.074 aeoc)15891 16. D/r Country [Linear) Statum Stat | 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 | | ۵. 0 | | 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 | A0.02 | 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. | A) 02 | 1 11 | A 600 | \$ < | 8 8 | |
| | | 10.0> | ព្ | <0.02 | ណ្ឌ | <0.02 | 놂 | <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 ବି | 40.02 20 | 32 | 4 4 A | N W | 4 4 8 8 | * 7 | A0.02 | s s | A A 3 S | , s | 88 | 1 S | 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 menaration 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 10 10 | 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 |

1 of 2

| 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 preparation 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 |
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| 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. (Jg/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 Ching | 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 |
| 50 C C | 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, C | to NiST (see ab 3 Uncertainty o).C. (1994). | ove). F NIST | | | | |

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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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| (µg/mL 402 402 402 402 402 402 | |
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| 6 - 6 6 6 6 6 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 | |

(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.

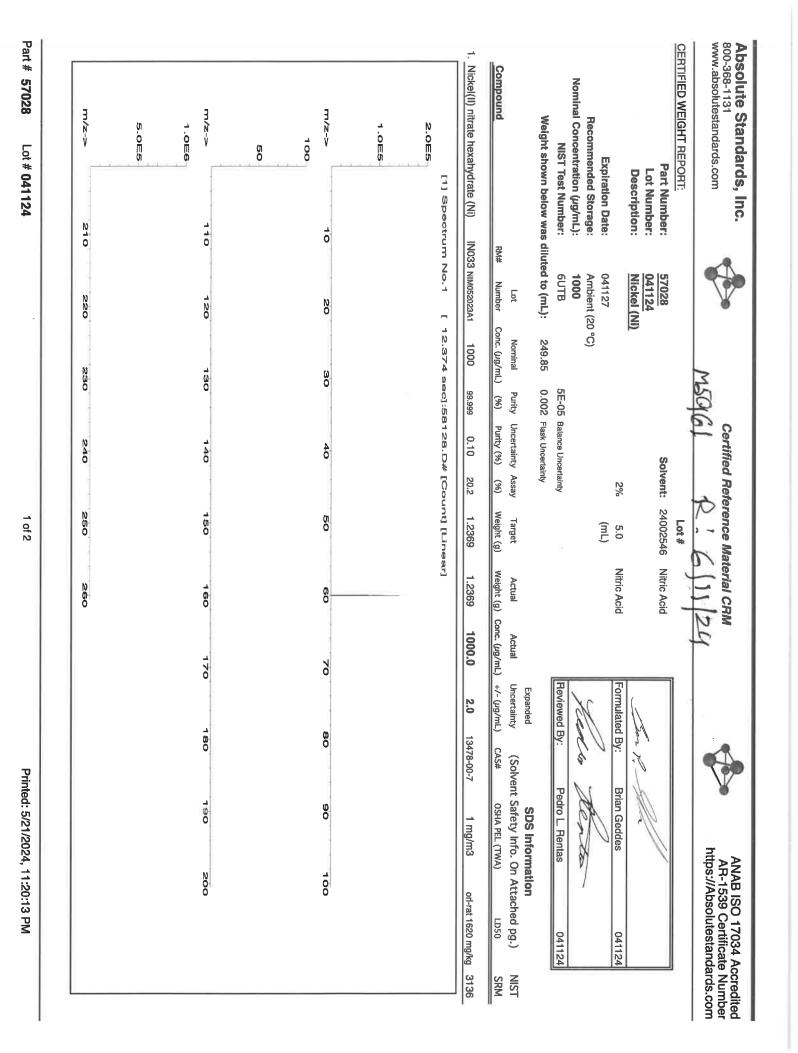
* All standards should be stored with caps tight and under appropriate laboratory conditions.

* 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 |

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|--|--|------------------|---|------------------|---------------------------------------|--------------------------------|--|-------------------------------|--|---|---|---|--|--|---|--|--|---|---|--|--|
| | | | | | | | | | | | 2 | | | 5 | | · · | | Ð | | | |
| | | | | | e). IST | rials are e abov ty 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. ticuloux ticuloux S96 of 1 B.N. au 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 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | 22 × 2 × 4 × 4 × | 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 |
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| alue is 18.2 n n of al prepar certife certife ferenc ferenc | heteroge | octeriz | | 5 S S | ଦୁ ଦୁ ଦୁ | Ca | nalysi | ds.com |
| The certified value is the concen Purified acids, 18.2 megohm deio the preparation of all standards. All standard containers are metic Standards are prepared gravimet Standards are certifed (+/-) 0.59 Standards should be stored w All standards should be stored w Uncertainty Reference: Taylor, E Measurement Result," NIST Tech | neity was | ation: | | 40.02 40.02 | <0.2 <0.02 | A.2 | s by Indu | , Inc. |
| entrati deionize ds. ds. sticulou netrical netrical i with c f with c f with c | observed | | | A Ga | 8 월 혁 (| Dv | uctivel | |
| 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 | l in the prep | | | <0.02 <0.02 <0.02 | <0.02 | A) 02 | y Couple | |
| calibra calibra ed prio palance and ur and ur c, C.E., c, C.E., | paration | | | Fe La | F F H | | d Plas | |
| The certified value is the concentration calculated from gravimetric and volumetric measury Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest 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 trac 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 Express Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washing | Homogeneity: No heterogeneity was observed in the preparation of this standard | | | <0.2 <0.02 | 40.02 20.02 | | Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): | |
| A glass A glass calibra calibra s for E s for E s for E | lard. | | | Hg Mo Nd | Mn Mn | Metals | Spectr | Certif |
| nd volume ware and ted with se stated laborator valuating Valuating Of | | | (T) = Ta | <0.2 <0.02 | <0.02 <0.02 | Verific | ometry () | ied Refe |
| etric m I the hi weight I. y cond and Ex and Ex | | | (T) = Target analyte | х P P | Pd Os Nb | ation | ICP-M | rence |
| * 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. * 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). | | | ılyte | <0.02 <0.02 <0.2 | <0.02 | Ann I Ni T I P. I | IS): | Certified Reference Material CRM |
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| | | | | | | | | Accredit te Numb dards.co |
| | | | | | | | | 1 3 6 8 |

| | 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 |

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|--|---|--|--|---|---|--|--|--|---|---|---|--|---|---|------|
| | 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. voratory 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 | |
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| 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- |



300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

Certificate of Analysis M5936, M5933 R: 02/22/24 P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 **ACCREDITATION / REGISTRATION**

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



2.0 **PRODUCT DESCRIPTION**

| Product Code: | Single Analyte Custom Grade Solution |
|---------------------------|--------------------------------------|
| Catalog Number: | CGMO1 |
| Lot Number: | T2-M0720876 |
| Matrix: | H2O |
| | tr. NH4OH |
| Value / Analyte(s): | 1 000 μg/mL ea: |
| | Molybdenum |
| Starting Material: | Ammonium Molybdate |
| Starting Material Lot#: | 2361 |
| Starting Material Purity: | 99.9893% |
| CEPTIEIED VALUES | |

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Assav Information:

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

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

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

| Characterization of CRM/RM by Two or More Methods | Characterization of CRM/RM by One Method |
|---|--|
| Certified Value, X _{CRWRM} , 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: |
| $\begin{split} & \textbf{X}_{CRM/RM} \equiv \boldsymbol{\Sigma}(\textbf{w}_i) \left(\textbf{X}_i \right) \\ & \textbf{X}_i = \text{mean of Assay Method : with standard uncertainty u_{char i} \\ & \textbf{w}_i = \text{the weightling factors for each method calculated using the inverse square of the variance.} \\ & \textbf{w}_i = (1/k_{ohar})^2 / (\boldsymbol{\Sigma}(1/(u_{char}))^2) \end{split}$ | $X_{CRM/RM} = (X_a) (u_{cher, a})$ $X_a = mean of Assay Method A withu_{cher, a} = the standard uncertainty of characterization Method A$ |
| CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{cs}$) ^{1/5} k = coverage factor = 2 $u_{char} = [\Sigma(w_p)^2 (u_{char}; p^2)]^{1/2}$ where u_{char} are the errors from each characterization method $u_{bb} = $ bottle to bottle homogeneity standard uncertainty $u_{lts} = long term stability standard uncertainty (storage) u_{ts} = transport stability standard uncertainty$ | CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char a} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{y₅} 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 |
| Page 1 of 4 | |

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 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 aliguots to container.

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 17, 2022

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

11.2 Lot Expiration Date

- July 17, 2027

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

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

Uyen Truong Supervisor, Product Documentation

Michael 2 Booth

Certificate Approved By:

Michael Booth **Director**, Technical

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine



300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

Certificate of Analysis M5936, M5933 R: 02/22/24 P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

1.0 **ACCREDITATION / REGISTRATION**

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



2.0 **PRODUCT DESCRIPTION**

| Product Code: | Single Analyte Custom Grade Solution |
|---------------------------|--------------------------------------|
| Catalog Number: | CGMO1 |
| Lot Number: | T2-M0720876 |
| Matrix: | H2O |
| | tr. NH4OH |
| Value / Analyte(s): | 1 000 μg/mL ea: |
| | Molybdenum |
| Starting Material: | Ammonium Molybdate |
| Starting Material Lot#: | 2361 |
| Starting Material Purity: | 99.9893% |
| CEPTIEIED VALUES | |

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Assav Information:

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

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

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

| Characterization of CRM/RM by Two or More Methods | Characterization of CRM/RM by One Method |
|---|--|
| Certified Value, X _{CRWRM} , 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: |
| $\begin{split} & \textbf{X}_{CRM/RM} \equiv \boldsymbol{\Sigma}(\textbf{w}_i) \left(\textbf{X}_i \right) \\ & \textbf{X}_i = \text{mean of Assay Method : with standard uncertainty u_{char i} \\ & \textbf{w}_i = \text{the weightling factors for each method calculated using the inverse square of the variance.} \\ & \textbf{w}_i = (1/k_{ohar})^2 / (\boldsymbol{\Sigma}(1/(u_{char}))^2) \end{split}$ | $X_{CRM/RM} = (X_a) (u_{cher, a})$ $X_a = mean of Assay Method A withu_{cher, a} = the standard uncertainty of characterization Method A$ |
| CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{cs}$) ^{1/5} k = coverage factor = 2 $u_{char} = [\Sigma(w_p)^2 (u_{char}; p^2)]^{1/2}$ where u_{char} are the errors from each characterization method $u_{bb} = $ bottle to bottle homogeneity standard uncertainty $u_{lts} = long term stability standard uncertainty (storage) u_{ts} = transport stability standard uncertainty$ | CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char a} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{y₅} 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 |
| Page 1 of 4 | |

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 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 aliguots to container.

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 17, 2022

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

11.2 Lot Expiration Date

- July 17, 2027

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

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

Uyen Truong Supervisor, Product Documentation

Michael 2 Booth

Certificate Approved By:

Michael Booth **Director**, Technical

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine

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 lienegomori etitod,ot etitod = dd^u adria = nost grind = dd^u erita

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

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 the transmission of the standard s

CERTIFIED VALUES AND UNCERTAINTIES 3.0

Starting Material Purity: 99.9975% Starting Material Lot#: 2094 Starting Material: In Metal unineti T 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 Manuel 2014) 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 |
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| | | | | | | | | | | | | | | | | | | | |

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

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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

NOITAM903NI SUOG9ASAH 0.8

| 1401150180, 14011702, 36Ar12C, 48Cs, 196X≃2 (Where X = Zr, Mo, Fu) Ωb, Ta, Cr, U | .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).

HINGS / LOPE corporations of an LOPE contained, while all solutions as the TI(F)6-2 chemically stable for years in HNOS / Lope container. 1-10,000 ppm single element solutions as the TI(F)6-2 chemically stable for years in TI Containing American and Solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 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

NOS Paulo 182

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 | P | | | 0 | ertified R | eference | Material CF | | | | AR | ANAB ISO 17034 Accredited AR-1539 Certificate Number | ocredited Number |
|--|------------|--|---------------------------------------|-----------|--------------------------|---------------|---------------|---------------|-------------------------|--------------|---|---|---------------------|
| | | | X | 6 | - | ž | K5981 R:61 | 1 | 124 | 6 | https | https://Absolutestandards.com | ards.com |
| CERTIFIED WEIGHT REPORT: | | | | | | Lot # | Solvent: | | | | | | |
| Part Number: Lot Number: | | 57092 060724 | | | | 24002546 | Nitric Acid | | Phina R | 1° man Mr. 9 | ARector | | |
| Description: | | Uranium (U) | ົງ | | | | | | 252 | | | | |
| | | | | | | 2.0% | 40.0 | Nitric Acid | Formulated By: | 2 | Giovanni Esposito | 060724 | |
| Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): | | 060727 Ambient (20 °C) 1000 | 0 °C) | | | | (mL) | | Jus | 42 . A | enter | | |
| NIST Test Number: | | GUTB | | 5E-05 | Balance Uncertainty | inty | | | Reviewed By: | | Pedro L. Rentas | 060724 | |
| Volume shown below was diluted to (mL): | was dilute | d to (mL): | 2000.07 | 0.100 | Flask Uncertainty | | | | | | | | - |
| | Part | Lot | Dilution | Initial | Uncertainty | Nominal | Initial | Final | Expanded Uncertainty | (Solven | SDS Information (Solvent Safety Info. On Attached pg.) | tion Attached po.) | NIST |
| Compound | Number | Number | Factor | Vol. (mL) | Vol. (mL) Pipette (mL) (| Conc. (µg/mL) | Conc. (ug/mL) | Conc. (µg/mL) | +/- (ug/ml.) | CAS# | OSHA PEL (TWA) | LD50 | SRM |
| 1. Uranyl nitrate hexahydrate (U) | 58192 | 041524 | 0.1000 | 200.0 | 0.084 | 1000 | 10001.5 | 1000.0 | 2.2 | 13520-83-7 | 0.05 mg/m3 | orl-rat 1040 mg/kg | 3164 |
| [1] Spectrum No.1 | trum No | а <u>н</u> | 23.254 sec]:57092.D# [Count] [Linear] | 9c]:570 | 092.D#[0 | ini) [mino | near] | | | | | | F |
| 1.0E6 | | | | | |) 1 | | | | | | | |
| | | | | | | | | | | | | | |
| 5.0E8 | | | | | | | | | | | | | |
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| | 10 | 0 | 30 | | 40 | 50 | 00 | 20 | | 80 | 08 | 100 | _ |
| 5.0E4 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 0.0 7 4 | | | | | | | | | | | | | |
| m/z-> | 0 | 120 | 130 | 0 | 440 | 150 | 160 | 021 | | 081 | Cer | 000 | |
| | | | | | | | | | | 0 | | | _ |
| 9 1 0 | | | | | 46468 | | | | | | | | |
| 6.0E5 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| m/z-> | 810 | 520 | 530 | 0 | 240 | 250 | 260 | | | | | | |
| | | | | | | | | | | | | |] |
| Part # 57092 Lot # 060724 | | | | | | 1 of 2 | | | | Printe | Printed: 6/7/2024, 3:58:45 PM | 8:45 PM | |
| | | | | | | | | | | | | | |

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



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| Cii <0.02 Au <0.02 Pb <0.02 Nd | K 402 | | | | | | 1 |

Physical Characterization:

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

Certified by:

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

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| Luts Solvent: 2110021 Ninic Acid 2.0% 40.0 Ninic Acid 2.0% 40.0 Ninic Acid 2.0% 40.0 Ninic Acid mininy Final Emmoded By: Beneon Chen mininy minish Expanded SDS Information v Nominal Intel Expanded SDS Information v 1000 1000.0 22 1050-034 Pictor 1000 1000.0 22 1500-03-0 IOO 1000 1000 22 1500-03-0 IOO 1000 100 100 100 100 100 1000 23 1500-05-3 M MA | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com | | | X | MS982 | rtified Re | ference A | Certified Reference Material CRM | 11/2 | 5 | | AL | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com | Accredited ate Number ndards.com |
|--|---|---------------------------------|-----------------------|-----|---------------------------|-------------------------------------|-------------------------|----------------------------------|------------------------|--|----------------|---|--|--|
| Epinitum Dist. Epinitation Dist. Other Abold and concentration Dist. Other Abold and concentration Dist. Other Abold and concentration Dist. Other Abold and concentration Dist. Epine List of the Abold and concentration Dist. Epine Dist. | CERTIFIED WEIGHT REPORT: Part Numbe Lot Numbe Description | | 23 23 nium (Zr) | | | | Lot # 21110221 | Solvent: Nitric Acid | | | | | | |
| NIST Test Number: Othome of the wave situation E::05 Balance of minute situation E::00: Dots in the mean situation E::00: Distribution E::00: Distribution E::00: Distribution E::00: Distribution E::00: Distribution Distri | Expiration Dat Recommended Storag Nominal Concentration (µg/ml | | 16 Int (20 °C) | J | | | 2.0% | 40.0 (mL) | | ormulated By | | Benson Chan | 071423 | 8 |
| Image: marker Test of | NIST Test Numbe Volume shown below | er: 6UTB v was diluted to (i | | | | alarce Uncertair ask Uncertainty | ytr | | | leviewed By: | | Pedro L, Rentas | 071423 | 23 |
| Indecenting (n) Statut Order Otder | Compound | | | | hritial (/ol. (mL) Pi | | Nomina! onc. (µg/mL) | Initial Conc. (µg/mL) (| Final Conc. (µg/mL) | Expanded Uncertainty +/- (µg/mL) | (Solv∉ CAS# | SDS Inform int Safety Info. Or OSHA PEL (TWA) | ation Attached pg.) LD50 | NIST SRM |
| 1.1 Spectrum No.1 [1.1.163 esc)[s7040.DM [Count] [Linear] 1.0E6 10 20 30 40 60 70 80 3c=b 10 20 30 40 60 70 80 4.0E8 1.0E 10 120 130 140 160 170 160 4.0E8 210 130 140 160 160 170 160 4.0E8 210 230 230 240 260 260 100 160 | 1. Zirconyl chloride octahydrate (Zr) | | | | 200.0 | 0.084 | 1000 | 10000.3 | 1000.0 | | | NA | | NA |
| 6:0EC 1:0 20 30 40 60 70 80 1:0E3 | - | atru No. | 4 | 000 | c]:670 | | T) [tunes | inearj | | | | | | |
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| 5.0E7 110 120 130 140 160 160 170 180 1.0E8 1.0E8 120 120 130 140 160 170 160 1.0E8 1.0E8 210 230 230 240 250 260 100 1.0E4/071423 10f4/071423 10f2 10f2 10f2 10f2 10f2 10f2 10f2 | ۵ 11 | | 0 | 0 | | 6 0 | 0 | D Ø | 02 | | Q | O | 000 | |
| 10 120 130 140 160 170 180 1.0E8 1.0E8 1.00 1.00 1.00 1.00 1.00 5.0E7 210 220 230 240 260 260 Iot# 071423 Iot# 07142 | £.0E ₹ | | | | | | | | | | | | | |
| 5.0€7 1/2-3 210 230 240 250 260 Lot # 071423 1012 | Ø | | Q | 130 | | 041 | 160 | 100 | 5 | | Ca | 190 | 200 | |
| 1/2 210 220 230 250 260 Lot # 071423 1 of 2 | 6.0E7 | | | | | | | | | | | | | |
| Lot # 071423 1 of 2 | | | 0 | 530 | | 240 | 580 | 260 | | | | | | |
| | | | | | | | 1 of 2 | | | | Printe | d: 6/7/2024, 3: | 58:47 PM | |

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Certified Reference Material CRM



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

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

| | | | | | | | I race N | letals | Verificat | tion b | y ICP-M | or) SN | /mL) | | | | | | |
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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 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).

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Lot # 071423 Part # 57040



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com R: 2/22/2024 M5999

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 | on |
|---------------------|---|------------------|
| Catalog Number: | CLPP-SPK-1 | |
| Lot Number: | T2-MEB721963 | |
| Matrix: | 7% (v/v) HNO3 | |
| Value / Analyte(s): | 2 000 µg/mL ea: Aluminum, | Barium, |
| | 1 000 μg/mL ea: Iron, | |
| | 500 μg/mL ea: Manganese, Vanadium, Cobalt, | Nickel, Zinc, |
| | 250 μg/mL ea: Copper, | |
| | 200 μg/mL ea: Chromium, | |
| | 50 µg/mL ea: Beryllium, AND UNCERTAINTIES | Silver |

3.0 CERTIFIED VALUES 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 | Chromium, Cr | 200.0 ± 1.1 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 | Manganese, Mn | 500.0 ± 2.0 µg/mL |
| Nickel, Ni | 500.0 ± 2.2 μg/mL | Silver, Ag | 50.00 ± 0.22 µg/mL |
| Vanadium, V | 500.0 ± 2.2 μg/mL | Zinc, Zn | 500.0 ± 2.2 μg/mL |
| | | | |

1.070 g/mL (measured at 20 ± 4 °C)

Assay Information:

Density:

| ANALYTE | METHOD | NIST SRM# | SRM LOT# |
|---------|-------------|-----------|--------------|
| Ag | ICP Assay | 3151 | 160729 |
| Ag | Volhard | 999c | 999c |
| Ag | Calculated | | See Sec. 4.2 |
| A! | ICP Assay | 3101a | 140903 |
| Al | EDTA | 928 | 928 |
| Ba | ICP Assay | 3104a | 140909 |
| Ba | Gravimetric | | See Sec. 4.2 |
| Be | ICP Assay | 3105a | 090514 |
| Be | Calculated | | See Sec. 4.2 |
| Co | ICP Assay | 3113 | 190630 |
| Co | EDTA | 928 | 928 |
| Cr | ICP Assay | 3112a | 170630 |
| Cu | ICP Assay | 3114 | 121207 |
| Cu | EDTA | 928 | 928 |
| Fe | ICP Assay | 3126a | 140812 |
| Fe | EDTA | 928 | 928 |
| Mn | ICP Assay | 3132 | 050429 |
| Mn | EDTA | 928 | 928 |
| 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_{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 Ass | ay Method i with standard uncertainty u _{char i} |
|------------------------------|--|
| | g factors for each method calculated using the inverse square of |
| the variance | |
| | |

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

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k \left(u^2_{char} + u^2_{bb} + u^2_{15} + u^2_{15} \right)^{\gamma_2}$ k = coverage factor = 2

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

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:

X_{CRM/RM} = (X_a) (u_{char a}) Xa = mean of Assay Method A with uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{chara}^2 + u_{bb}^2 + u_{tts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 uchar a = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty uits = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this 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: 800.869.8799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

Page 3 of 4

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

11.1 Certification Issue Date

July 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

- July 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

SD9781.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

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





Material No.: 9530-33 Batch No.: 24D1562005 Manufactured Date: 2024-03-18 Retest Date: 2029-03-17 Revision No.: 0

Merenvez - 08/01/2024 Pater m 6039 m 6039 Certificate of Analysis

| Test | Specification | Result |
|---|---------------|-------------|
| ACS – Assay (as HCI) (by acid-base titrn) | 36.5 - 38.0 % | 37.6 % |
| ACS – Color (APHA) | ≤ 1 0 | 5 |
| ACS - Residue after Ignition | ≤ 3 ppm | < 1 mgg 1 > |
| ACS - Specific Gravity at 60°/60°F | 1.185 - 1.192 | 1.192 |
| 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 | < 5.0 ppb |
| Arsenic and Antimony (as As) | ≤ 5.0 ppb | < 3.0 ppb |
| Trace Impurities ~ Barium (Ba) | ≤ 1.0 ppb | < 1.0 ppb |
| Trace Impurities – Beryllium (Be) | ≤ 1.0 ppb | < 1.0 ppb |
| Trace Impurities – Bismuth (Bi) | ≤ 10.0 ppb | < 10.0 ppb |
| Trace Impurities ~ Boron (B) | ≤ 20.0 ppb | 2.2 ppb |
| Trace Impurities – Cadmium (Cd) | ≤ 1.0 ppb | < 1.0 ppb |
| Trace Impurities - Calcium (Ca) | ≤ 50.0 ppb | 31.0 ppb |
| Trace Impurities - Chromium (Cr) | ≤ 1.0 ppb | 0.5 ppb |
| Trace Impurities - Cobalt (Co) | ≤ 1.0 ppb | 0.2 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 | 3 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.: 24D1562005

| Test | Specification | Result |
|--|----------------|------------|
| Trace Impurities - Lead (Pb) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities - Lithium (Li) | \leq 1.0 ppb | < 0.1 ppb |
| Trace Impurities – Magnesium (Mg) | ≤ 10.0 ppb | 2.2 ppb |
| Trace Impurities – Manganese (Mn) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Mercury (Hg) | ≤ 0.5 ppb | < 0.1 ppb |
| Trace Impurities – Molybdenum (Mo) | ≤ 10.0 ppb | < 5.0 ppb |
| Trace Impurities - Nickel (Ni) | ≤ 4.0 ppb | 0.2 ppb |
| Trace Impurities – Niobium (Nb) | ≤ 1.0 ppb | < 0.2 ppb |
| Trace Impurities – Potassium (K) | ≤ 9.0 ppb | < 1.0 ppb |
| Trace Impurities – Selenium (Se), For Information Only | | < 1.0 ppb |
| Trace Impurities – Silicon (Si) | ≤ 100.0 ppb | < 10.0 ppb |
| Trace Impurities – Silver (Ag) | ≤ 1.0 ppb | < 0.3 ppb |
| Trace Impurities – Sodium (Na) | ≤ 100.0 ppb | 2.0 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 | < 0.4 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 | < 0.2 ppb |
| Trace Impurities – Zirconium (Zr) | ≤ 1.0 ppb | < 0.1 ppb |
| | | |

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



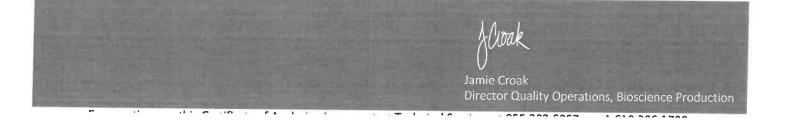


Material No.: 9530-33 Batch No.: 24D1562005

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





Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

1.025 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

| Characterization of CRM/RM by Two or More Methods | Characterization of CRM/RM by One Method |
|---|--|
| Certified Value, X _{CRWRM} , 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: |
| $\mathbf{x}_{\mathbf{CRM/RM}} = \Sigma(\mathbf{w}_i) (\mathbf{x}_i)$ | $X_{CRM/RM} = (X_{a}) (u_{char a})$ |
| X _i = mean of Assay Method I with standard uncertainty u _{char i} | X _a = mean of Assay Method A with |
| w_j = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{char})^2 / (\Sigma(1/(u_{char})^2))$ | $\boldsymbol{u}_{char,a}$ = the standard uncertainty of characterization Method A |
| CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$ | CRM/RM Expanded Uncertainty (1) = U _{CRM/RM} = k (u ² _{char a} + u ² _{bb} + u ² _{fts} + u ² _{ts}) [%] |
| 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 |
| Certified Abundance: | |
| IV's Certified Abundance | |

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

11.1 Certification Issue Date

June 21, 2023

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

11.2 Lot Expiration Date

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

SD9781. Paul R Saine

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

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

| Μ | 6 | ۱ | 2 | 1 |
|---|---|---|---|---|
| _ | _ | - | | |

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





R-> 11/12/24 TH6126

Material No.: 9606-03 Batch No.: 24D1062002 Manufactured Date: 2024-03-26 Retest Date: 2029-03-25 **Revision No.: 0**

Certificate of Analysis

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

>>> Continued on page 2 >>>

Nitric Acid 69% CMOS





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

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

For Microelectronic Use

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



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

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



Certified Reference Material CRM



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

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

| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | | - | 20.02 | | 20.05 | 18 | <0.0Z | × | 40.2 | ĸ | <0.02 | Nd | <0.02 | Рb | <0.02 | Au | <0.02 | ç | <0.02 | 8 |
|--|--|-----|-----|-------|-----|-------|-----|-------|-----|-------|----|-------|----|-------|-----|-------|----------|-------|----------------|-------|-----|
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | λ. | 2 | 2002 | 9 8 | 0.02 | 3 6 | 10.02 | 311 | 20.02 | 2 | <0.02 | MO | 20.05 | 5 | Z0102 | ନ୍ନ | <0.02 | S | <0.02 | æ. |
| 40.02 Cd 40.02 Dy 40.02 Hf 40.02 Ni 40.02 Pr 40.02 Sc 40.2 To 40.02 W 40.02 Ca 40.2 Er 40.02 Hi 40.02 Ni 40.02 Pr 40.02 Sc 40.2 To 40.02 V 40.02 Ca 40.2 Er 40.02 Ho 40.02 Na 40.02 Re 40.02 Si 40.02 To 40.02 V 40.02 Na 40.02 Na 40.02 Na 40.02 V 40.02 Va 40.02 <t< td=""><td>$\begin{array}{c ccccccccccccccccccccccccccccccccccc$</td><td>4</td><td>Zn</td><td>-0.02</td><td>2</td><td>2002</td><td>0</td><td>5</td><td>2</td><td>3</td><td>2</td><td>3</td><td></td><td>200</td><td>1 (</td><td></td><td></td><td>10.02</td><td>1</td><td>10.01</td><td>Ş</td></t<> | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | 4 | Zn | -0.02 | 2 | 2002 | 0 | 5 | 2 | 3 | 2 | 3 | | 200 | 1 (| | | 10.02 | 1 | 10.01 | Ş |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | 6 | Y | <0.02 | Tm | <0.02 | S | <0.02 | Ru | <0.02 | ŋ | 40,2 | Hø | 40.2 | 21 | 40.02 | <u>.</u> | AD 03 | 2 | 100 | E . |
| 40.02 Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se 40.2 Th 40.02 W 40.02 Ca 40.2 Er 40.02 Hf 40.02 Li 40.02 Pr 40.02 Se 40.2 Th 40.02 W 40.02 Ca 40.2 Er 40.02 Ha 40.02 Nb 40.02 Re 40.02 Si 40.02 T 40.02 V | 40.02 Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se 40.2 Tb 40.02 W 40.02 Ca 40.2 Er 40.02 Hf 40.02 Li 40.02 N 40.02 Se 40.2 Tb 40.02 U 40.02 Ca 40.02 Hr 40.02 Li 40.02 Nb 40.02 Se 40.2 Tb 40.02 U 40.02 Ca 40.02 Hr 40.02 Mg T 0s 40.02 Rb 40.02 Tb 40.02 U 40.02 Ca 40.02 In 40.02 Mg T 0s 40.02 Rb 40.02 Tb 40.02 V 40.02 Ca 40.02 In 40.02 Mg T 0s 40.02 Rb 40.02 Tb 40.02 V 40.02 Fin 40.02 Mg T 0s 40.02 Rb 40.02 | . 6 | IO | 20.02 | 10 | 40.2 | Næ | <0.02 | Rb | <0.02 | Pd | <0.02 | Mn | <0.02 | ŀ | <0.02 | R | <0.02 | S | <0.02 | Ba |
| Cd CD Li < | 40.02 Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se 40.2 Tb 40.02 W 40.02 Ca 40.2 Er 40.02 Hf 40.02 Li 40.02 Nb 40.02 Se 40.2 Tb 40.02 U 40.02 Ca 40.02 Ho 40.02 Lu 40.02 Nb 40.02 Si 40.02 Tc 40.02 U | 56 | ģ < | 20.02 | | 20.02 | Ag | <0.02 | Rb | <0.02 | 0s | Ţ | Mg | <0.02 | In | <0.02 | 臣 | <0.02 | ŝ | <0.2 | As |
| | <th< td=""><td>3 6</td><td>< c</td><td>20.02</td><td>1</td><td>20.02</td><td>2</td><td>20.02</td><td>KC</td><td><0.02</td><td>NP</td><td><0.02</td><td>La</td><td><0.02</td><td>Но</td><td><0.02</td><td>막</td><td>40.2</td><td>C₂</td><td><0.02</td><td>SP</td></th<> | 3 6 | < c | 20.02 | 1 | 20.02 | 2 | 20.02 | KC | <0.02 | NP | <0.02 | La | <0.02 | Но | <0.02 | 막 | 40.2 | C ₂ | <0.02 | SP |
| | | 3 | ; : | 3 | 3 3 | 5 | a g | 10.02 | 1 | 0.02 | 1 | <0.02 | F | 20.02 | HI | 20.02 | Ŋ | <0.02 | 2 | <0.02 | A |
| | | 4 | W | 40.02 | 7 | c (b) | S | and | Dr | 3 | | 2003 | 1 | 200 | | | | | | | |

(I) = larget analyte

Physical Characterization:

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

Son P. A.

Certified by:

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

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

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

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

* All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST

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

Part # 58112 Lot # 112124

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

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





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

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

(T) = Target analyte

Physical Characterization:

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

for P. S.

Certified by:

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

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Part # 58025 Lot # 101124

| _ | | | | / | | | 1. Sodium nitrate (Na) | Compound | Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa | CERTIFIED WEIGHT REPORT: Part Numbei Lot Numbei | Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com |
|-------------|-------------------|----------------|----------|----------------|-------|--------------------------------------|------------------------|--|--|---|--|
| m/z-> | N 0 11 0 | m/z-≻ 5.0E6 | N.5 6 | m/z-> 5.0∈6 | 2.5E5 | 5.0E5 | trate (Na) | đ | Description: Sodium (Expiration Date: 12226 Recommended Storage: Ambient (2 I Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was dliuted to (mL): | <u>VEIGHT RE</u> Part I Lot I | standards.c |
| | | | | | | [1] Spec | = | | Description: Expiration Date: nended Storage: ntration (µg/mL): htration (µg/mL): T Test Number: ST Test Number: | HT REPORT: Part Number: Lot Number: | om |
| 0 | | 110 | | 10 | | [1] Spectrum No.1 | IN036 NAV01201511 | Lot RM# Number | Sodiur 12226 Ambien 10000 6UTB 6UTB | <u>58111</u> 122223 | |
| N N O | | 120 | | N. O | | - | | | | 23 | V |
| 230 | | 130 | | а О | | | 10000 99.999 | Nominal Purity Conc. (µg/mL) (%) | 5) 3000.4 0.06 | | RIO |
| | | and here and | | | | 8.935 sec]:58111.D# [Count] [Linear] | 999 0.10 | ity Uncertainty) Purity (%) | 2% 5E-05 Balance Uncertainty 0.06 Flask Uncertainty | | Certi |
| 240 | | 140 | | 6 | | .D# [Cot | 26.9 | Assay (%) | 2% ncertainty ertainty | Solvent: | ified Refu |
| N U O | | 150 | | Ö | | unt) [Line | 111.5406 | Target Weight (g) | 60.0 (mL) | Lot # 24002546 | erence Mi MSR 0 |
| 280 | | 160 | | 0 O | | ar] | 111.5479 | Actual Weight (g) | Nitric Acid | Nitric Acid | Certified Reference Material CRM 5 124 MSR06 MS |
| | | | | N | | | 10000.7 | Actual Conc. (µg/mL) | | 3 | RM 5807 |
| | | 170 | | 70 | | | 20.0 | Expanded Uncertainty +/- (µg/mL) | Formulated By: | Allea | |
| | | 180 | | 80 | | | 7631-99-4 | 0 | By: | aha | |
| | | 190 | | 80 | | | 5 mg/m3 | SUS information (Solvent Safety Info. On Attached pg.) AS# OSHA PEL (TWA) LD50 | Aleah O'Brady | Brad | × |
| | | 200 | | 100 | | | | SUS Information afety Info. On Atta OSHA PEL (TWA) | ady C | All I | ANAB AR-1 https:/// |
| | | ŏ | | ŏ | | | orl-rat 3430 mg/kg | ached pg.) سەءە | 122223 | | ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com |
| | | | | | | | 9/kg 3152a | NIST | 223 | | 4 Accred cate Num andards.c |

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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 of the st and Ku 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 |

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

VENTURES

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M5743

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

1.0 **ACCREDITATION / REGISTRATION**

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

A: 4/11/22



2.0 **PRODUCT DESCRIPTION**

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

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

Density:

1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

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

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

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

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

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

4.0 **TRACEABILITY TO NIST**

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 03, 2021

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

11.2 Lot Expiration Date

- September 03, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Bath

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine

RD: 07/14/2022



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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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



Page 1 of 2



ICSB: M5874

ICSA-0803, Inferferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO₃. Analyze this solution by ICP-MS.

ICSB-0803, Analytes, mixed with ICSA-0803, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO₃. Analyze this ICSAB solution by ICP-MS.

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

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

| | Table 1. | | VALUES" FOF 303, AND ICSA | | | | MS |
|---------|----------|------------------|------------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element | CRQL | Part A (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) | Part A +Part B (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) |
| AI | 20.0 | [100000] | | | [100000] | | |
| Sb | 2.0 | (1.5) | -2.5 | 5.5 | (22.0) | 18.0 | 26.0 |
| As | 1.0 | (0.1) | -1.9 | 2.1 | 19.0 | 16.2 | 21.9 |
| Ba | 10.0 | (1.2) | -18.8 | 21.2 | (22.0) | 2.0 | 42.0 |
| Be | 1.0 | (0) | -2.0 | 2.0 | 19.0 | 16.2 | 21.9 |
| Cd | 1.0 | (0.7) | -1.3 | 2.7 | 20.0 | 17.0 | 23.0 |
| Ca | 500 | [100000] | | | [100000] | | |
| С | | [200000] | | | [200000] | | |
| CI | | [1000000] | | | [1000000] | | |
| Cr | 2.0 | (21.0) | 17.0 | 25.0 | 40.0 | 34.0 | 46.0 |
| Co | 1.0 | (1.0) | -1.0 | 3.0 | 20.0 | 17.0 | 23.0 |
| Cu | 2.0 | (8.0) | 4.0 | 12.0 | (25.0) | 21.0 | 29.0 |
| Fe | 200 | [100000] | | | [100000] | | |
| Pb | 1.0 | (4.0) | 2.0 | 6.0 | 25.0 | 21.3 | 28.8 |
| Mg | 500 | [100000] | | | [100000] | | |
| Mn | 1.0 | (7.0) | 5.0 | 9.0 | 27.0 | 23.0 | 31.1 |
| Мо | | [2000] | | | [2000] | | |
| Ni | 1.0 | (6.0) | 4.0 | 8.0 | 24.0 | 20.4 | 27.6 |
| Р | | [100000] | | | [100000] | | |
| K | 500 | [100000] | | | [100000] | | |
| Se | 5.0 | (0.3) | -9.7 | 10.3 | (19.0) | 9.0 | 29.0 |
| Ag | 1.0 | (0) | -2.0 | 2.0 | 18.0 | 15.3 | 20.7 |
| Na | 500 | [100000] | | | [100000] | | |
| S | | [100000] | | | [100000] | | |
| TI | 1.0 | (0) | -2.0 | 2.0 | 21.0 | 17.9 | 24.2 |
| Ti | | [2000] | | | [2000] | | |
| V | 5.0 | (0.5) | -9.5 | 10.5 | (19.0) | 9.0 | 29.0 |
| Zn | 5.0 | (11.0) | 1.0 | 21.0 | (29.0) | 19.0 | 39.0 |

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

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

ICSA: M5873

RD: 07/14/2022



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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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



Page 1 of 2



ICSB: M5874

ICSA-0803, Inferferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO₃. Analyze this solution by ICP-MS.

ICSB-0803, Analytes, mixed with ICSA-0803, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO₃. Analyze this ICSAB solution by ICP-MS.

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

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

| | Table 1. | | VALUES" FOF 303, AND ICSA | | | | MS |
|---------|----------|------------------|------------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| Element | CRQL | Part A (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) | Part A +Part B (µg/L) | Lower Limit (µg/L) | Upper Limit (µg/L) |
| AI | 20.0 | [100000] | | | [100000] | | |
| Sb | 2.0 | (1.5) | -2.5 | 5.5 | (22.0) | 18.0 | 26.0 |
| As | 1.0 | (0.1) | -1.9 | 2.1 | 19.0 | 16.2 | 21.9 |
| Ba | 10.0 | (1.2) | -18.8 | 21.2 | (22.0) | 2.0 | 42.0 |
| Be | 1.0 | (0) | -2.0 | 2.0 | 19.0 | 16.2 | 21.9 |
| Cd | 1.0 | (0.7) | -1.3 | 2.7 | 20.0 | 17.0 | 23.0 |
| Ca | 500 | [100000] | | | [100000] | | |
| С | | [200000] | | | [200000] | | |
| CI | | [1000000] | | | [1000000] | | |
| Cr | 2.0 | (21.0) | 17.0 | 25.0 | 40.0 | 34.0 | 46.0 |
| Co | 1.0 | (1.0) | -1.0 | 3.0 | 20.0 | 17.0 | 23.0 |
| Cu | 2.0 | (8.0) | 4.0 | 12.0 | (25.0) | 21.0 | 29.0 |
| Fe | 200 | [100000] | | | [100000] | | |
| Pb | 1.0 | (4.0) | 2.0 | 6.0 | 25.0 | 21.3 | 28.8 |
| Mg | 500 | [100000] | | | [100000] | | |
| Mn | 1.0 | (7.0) | 5.0 | 9.0 | 27.0 | 23.0 | 31.1 |
| Мо | | [2000] | | | [2000] | | |
| Ni | 1.0 | (6.0) | 4.0 | 8.0 | 24.0 | 20.4 | 27.6 |
| Р | | [100000] | | | [100000] | | |
| K | 500 | [100000] | | | [100000] | | |
| Se | 5.0 | (0.3) | -9.7 | 10.3 | (19.0) | 9.0 | 29.0 |
| Ag | 1.0 | (0) | -2.0 | 2.0 | 18.0 | 15.3 | 20.7 |
| Na | 500 | [100000] | | | [100000] | | |
| S | | [100000] | | | [100000] | | |
| TI | 1.0 | (0) | -2.0 | 2.0 | 21.0 | 17.9 | 24.2 |
| Ti | | [2000] | | | [2000] | | |
| V | 5.0 | (0.5) | -9.5 | 10.5 | (19.0) | 9.0 | 29.0 |
| Zn | 5.0 | (11.0) | 1.0 | 21.0 | (29.0) | 19.0 | 39.0 |

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

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

ICSA: M5873

| | 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 | | | \$ 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) | | Reviews | 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):

| | | | | | | | I race M | etals | Verifica | tion | by ICP-N | IS (II) | g/mL) | | | | | | |
|----------|-------|-----|--------------|-----|-------|-----|--------------------|---------------|-------------------|------|-------------|-----------------|--------|-----|--|------------------|---|-----|-------|
| A | B | 2 | 202 | 2 | - | 1 | MILLION CONTRACTOR | Manual | AND IN THE OWNER. | | | No. of Lot, No. | | | Contraction of the local division of the loc | CONTRACTO | AL INCOME | | |
| 2 | 20.02 | 5 | 20.02 | Dy | 40.02 | Hf | 40.02 | E | <0.02 | Ni | 40.02 | 7 | 20.02 | Se | <0.2 | 7 | 400 | W | 200 |
| S | | ۍ | 4 | ដ | 2003 | Ľ, | ŝ | 4 | 2 | 1 | | 1 | | | 1012 | | 10.02 | ** | 20.02 |
| | 5, | | | 1 | 20.00 | CR1 | 70.02 | L | 20.02 | NP | 40.02 | Re | 40.02 | 2 | 40.02 | P | 20102 | 9 | 4000 |
| au. | 202 | ß | 20.02 | ñ | 40.02 | 5 | A ,92 | M | 40,01 | õ | 4002 | R. | 23 | A. | 2003 | 3 | 3 | 4 | |
| B | 2020 | ç | 33 | 5 | 5 | ľ | 3 | 5, | | ! | | - | mot on | 94. | TNN | | 20.02 | ~ | 20.02 |
| 1 | | u g | 10.02 | ę | 70.02 | - | 20.05 | MD | 20.02 | Pd | 40.02 | 8 | 40.02 | Za | A | þ | 40.02 | Ş | 3 |
| De | 1000 | ç | 40,02 | ନ୍ଥ | 40,02 | 4 | 402 | He | A 12 | Ð | 300 | 2 | 33 | n' | 3 | 1 | 3 | : : | |
| <u>H</u> | 43 | 3 | 3 | P | 3 | 4 | | | | | | 111 | 700.00 | ġ | 20.02 | 101 | <u.u2< td=""><td>1</td><td>20.02</td></u.u2<> | 1 | 20.02 |
| | | 1 | 20.02 | G | 20.05 | 5 | 20.02 | Mo | 20.02 | 7 | 0 02 | S | 40.02 | 6 | AN 03 | 3 | 33 | 7 | 3 |
| G | SUUS | ç | A .02 | Au | | y | A B | K | 200 | 4 | 5 | 2 | 5 | 3, | | | 10.00 | 1 | 70.02 |
| | | | | I | | | | | NAL ON | ļ | 44 | Ŕ | 20.02 | 12 | 20.02 | 11 | 40.02 | 2 | 20.02 |

(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 ព | [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):

| | | | | | | | | -lecais | VCITICA | | by ICFT | SIC 1 | hailer | | | | | | |
|----|--------------|---|------------|----------|--------------|----------|--------------|----------------------|---------|-----|------------------------|-------|-----------------------|----------|-------|-----|-------|----|-------|
| | | | The shares | A COLUMN | THE WAY DOWN | State of | 12.12.2.2016 | 18 - ¹ 19 | | 100 | The state of the state | | 1.40 . 10 . 10 . 10 E | No. | | No. | | | |
| A | <0.02 | 8 | <0.02 | Dy | <0.02 | Hf | <0.02 | 5 | <0.02 | N | <0.02 | 7 | <0.02 | Se | <0.2 | ТЪ | <0.02 | W | <0.02 |
| Sb | <0.02 | ß | <0.2 | 막 | 40.02 | Но | <0.02 | Lu | <0.02 | ĥ | <0.02 | Re | <0.02 | <u>8</u> | <0.02 | Te | <0.02 | q | <0.02 |
| As | 4 0.2 | ĉ | <0.02 | 땹 | <0.02 | h | <0.02 | Mg | <0.01 | õ | <0.02 | Rh | <0.02 | Ag | T | 1 | <0.02 | < | <0.02 |
| Ba | <0.02 | S | <0.02 | ନ୍ଥ | <0.02 | Ħ | <0.02 | Mn | <0.02 | Pd | <0.02 | Rb | <0.02 | Na | <0.2 | Ţ | <0.02 | YЪ | <0.02 |
| Be | <0.01 | Ω | <0.02 | ଦ୍ଧ | <0.02 | Fe | <0.2 | Hg | 40.2 | p | <0.02 | Ru | <0.02 | ş | <0.02 | Tm | <0.02 | × | <0.02 |
| B | <0.02 | S | <0.02 | ନ୍ନ | <0.02 | L | <0.02 | Mo | <0.02 | Ŗ | <0.02 | Sm | <0.02 | Ś | <0.02 | Sh | <0.02 | 2 | <0.02 |
| μ. | <0.02 | ß | <0.02 | Au | <0.02 | Pb | <0.02 | Nd | <0.02 | K | 40 2 | Ş | <0.02 | Ta | <0.02 | Ð | <0.02 | 2 | <0.02 |

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

Physical Characterization:

(T)= Target analyte

Certified by:

In & She

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

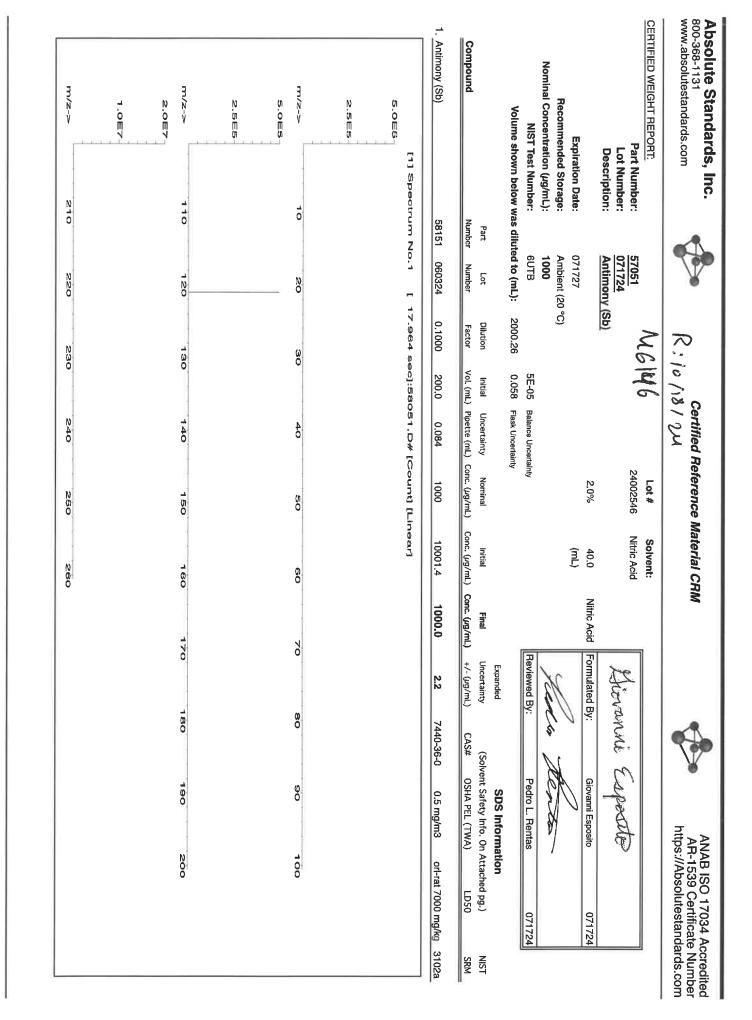
the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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



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Certified Reference Material CRM



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

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

| | _ | | | | SP | | | |
|--------|-------|-------|-------|--------|-------|-------|----------|--|
| | | | | | T | | | |
| Ω Ω | ŝ | ç | ŝ | ů | Ca | Q | | |
| <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.2 | <0.02 | | |
| Au | ନ୍ଚ | Ga | ଜ | En | Ę | Dy | | |
| <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | |
| Pb | La | Fe | ŀ | μ | Ho | Hf | | |
| <0.02 | <0.02 | <0.2 | <0.02 | <0.02 | <0.02 | <0.02 | Irace M | |
| Nd | Mo | Hg | Mn | Mg | Lu | Ľ | letais | |
| <0.02 | <0.02 | <0.2 | <0.02 | < 0.01 | <0.02 | <0.02 | Verifica | |
| K | Pt | P | Pd | °s | ĥ | Ni | tion | |
| <0.2 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | by ICP-N | |
| Sc | Sm | Ru | Rb | Rh | Re | P | in) SI | |
| <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | g/mL) | |
| Ta | s | Sr | Na | Ag | Si | Se | | |
| <0.02 | <0.02 | <0.02 | <0.2 | <0.02 | <0.02 | <0.2 | | |
| T | Sn | Tm | Τħ | T | Te | Τb | | |
| <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | | |
| Zr | Zn | Y | Υь | V | Ч | W | | |
| <0.02 | <0.02 | <0.02 | <0.02 | <0,02 | <0.02 | <0.02 | | |

(T) = Target analyte

Physical Characterization:

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

Son P. Mar

Certified by:

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

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



Certificate of Analysis

R: 8/5/24 M6019

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

| Product Code: | Single Analyte Custom Grade Solution |
|---------------------------|--------------------------------------|
| Catalog Number: | CGSR1 |
| Lot Number: | U2-SR730227 |
| Matrix: | 0.1% (v/v) HNO3 |
| Value / Analyte(s): | 1 000 μg/mL ea: Strontium |
| Starting Material: | SrCO3 |
| Starting Material Lot#: | M2-2192 |
| Starting Material Purity: | 99.9993% |
| CERTIFIED VALUES AN | ID UNCERTAINTIES |

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

Assay Information:

3.0

| Assay Method #1 | 998 ± 4 μg/mL ICP Assay NIST SRM Traceable to 3153a Lot Number: K2-SR650985 |
|-----------------|---|
| Assay Method #2 | 1001 ± 3 μg/mL EDTA NIST SRM 928 Lot Number: 928 |
| Assay Method #3 | 1001 ± 2 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2 |

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

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

Characterization of CRM/RM by Two or More Methods

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

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

- X_i ≃ mean of Assay Method i with standard uncertainty u_{char} i w_i = the weighting factors for each method calculated using the inverse square of the variance:
 - $w_{i} = (1/u_{char\,i})^{2} / (\Sigma(1/(u_{char\,i})^{2})$

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k ($u^2_{cher} + u^2_{bb} + u^2_{lts} + u^2_{ts}$)^{1/2} k = coverage factor = 2 $u_{cher} = [Z(w_i)^2 (u_{char} i)^2]$ ^{1/2} where u_{char} i are the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty

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

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

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

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

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

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 11.0

11.1 Certification Issue Date

March 03, 2023

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

11.2 Lot Expiration Date

- March 03, 2028

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

BD9784.

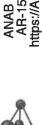
Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

| Absolute Standards, Inc. 800-368-1131 | | | Certified | Reference | Certified Reference Material CRM | | | ANAB IS | ANAB ISO 17034 Accredited |
|---|---|----------------------------|--|--------------------------------|---|------------|---|--|-------------------------------|
| www.absolutestandards.com | 5 | Rr 03/161 | 116123 | M5473 | hthew | EHZW | AFPR MERSM | https://Ab | https://Absolutestandards.com |
| CERTIFIED WEIGHT REPORT: | | | | Lot # | | | | | |
| Part Number: Lot Number: Description: | r: <u>56138</u> r: <u>082922</u> n: Strontium (Sr) | (Sr) | So | Solvent: 20510011 | 11 Nitric Acid | <u> </u> | Admin | Con Con | |
| Expiration Date: Recommended Storage: Nominal Commended Storage: | | 0 °C) | | 2% 20.0 (mL) | Nitric Acid | <u> ŭ </u> | Formulated By: | Lawrence Barry | 082922 |
| Weight shown below was diluted to (mL): | Accession of the second second | 51 1000.12 0 | 5E-05 Balance Uncertainty 0.058 Flask Uncertainty | tainty nty | | | Reviewed By: | Pedro L. Rentas | 082922 |
| Compound | Lot RM# Number | Nominal P Conc. (µg/mL) | Purity Uncertainty Assay (%) Purity (%) (%) | Assay Target (%) Weight (g) | Actual Ac tual 3) Weight (g) Conc. (ug/mL) | | Expanded Uncertainty (Solv +/- (µg/mL) CAS# | SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD5G | ed pg.) NIST LD50 SRM |
| 1. Strontium nitrate (Sr) | IN017 SRZ022018A1 | 10000 9 | 99.997 0.10 | 41.2 24.2756 | 24.2758 | 10000.1 | 20.0 10042-76-9 | NA orl- | orl-rat >2000mg/kg 3153a |
| 5.0E6 | - | 4.495 sec | 14.495 sec]:58138.D# [Count] [Linear] | [Count] | ear] | | | | |
| N N N | | | | | | | | | |
| m/z-> | 10 20 | O M | 40 | 2 Q | 0 9 | 20 | 08 | 90 100 | |
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| a/2-> 5.0E6 | 0 120 | 130 | 140 | 150 | 160 | 170 | 1 80 | 190 200 | |
| 5 2 5 | | | | | | | | | |
| m/z-> | 0 220 | 230 | 240 | 250 | 260 | | | | |
| Part # 56138 Lot # 082922 | | | | 1 of 2 | | | Print | Printed: 9/21/2022, 11:20:01 PM | Wd |

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

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

| - | <0.02 | CG | <0.02 | Dy | <0.02 | Hf | <0.02 | Ľ! | <0.02 | ïŻ | <0.02 | Pr | <0.02 | Se | <0.2 | Tb | <0.02 | M | <0.02 |
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| s, | <0.2 | రి | <0.02 | Eu | <0.02 | Ц | <0.02 | Mg | <0.01 | ő | <0.02 | Rh | | Ag | <0.02 | F | <0.02 | > | <0.02 |
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| _ | <0.02 | Ū | <0.02 | ΝN | <0.02 | Pb | <0.02 | PN | <0.02 | м | <0.2 | Sc | | Ta | <0.02 | ï | <0.02 | 75 | <0.02 |

(T)= Target analyte

Physical Characterization:

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

Certified by:

n N

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

the preparation of all standards

All standard containers are meticulously cleaned prior to use.

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

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

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

| 800-368-1131 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 | | loid | 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

1 of 2

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

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

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(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 | 2.5E8 | |
|--|----------|---|-------------------------|---------------------|-------------------|---|-------------------------------|---------------------------------------|--|---------------|-------|-------|------------------|-------|-----|
| A. 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 | | | | | | | | |

1 of 2

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Lot # 062424

Part # 57023





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

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

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Physical Characterization:

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

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Certified by:

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

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

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

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