

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

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

Order ID: P3609

Test: Mercury, Metals Group4

**Prepbatch ID:** PB163150,PB163151,

Sequence ID/Qc Batch ID: LB132269,LB132280,

### Standard ID:

 $\label{eq:mp81818} MP81819, MP81820, MP81821, MP82127, MP82134, MP82135, MP82136, MP82137, MP82138, MP82139, MP82140, MP82141, MP82142, MP82143, MP82144, MP82145, MP82146, MP82148, MP82149, MP82150, MP82151, MP82152, MP82153, MP82155, MP82156, MP82157, MP82158, MP82159, MP82160, MP82161, MP82162, MP82163, MP82164, MP82165, MP82166, MP82167, MP82168, MP82192, MP82193, MP82194,$ 

### Chemical ID:

M4251,M4399,M4465,M4888,M4916,M5062,M5192,M5218,M5227,M5288,M5295,M5304,M5390,M5476,M5497,M5498,M5513,M5515,M5519,M5545,M5613,M5658,M5697,M5698,M5739,M5769,M5798,M5799,M5800,M5801,M5802,M5806,M5815,M5817,M5818,M5819,M5873,M5874,M5882,M5953,M5961,M5962,M5963,M5976,M5978,M5981,M5982,M5983,M6023,M6023,M6028,M6030,M6033,M6034,M6037,M6040,M6055,W3112,



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## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3965	2:1 H2SO4 : HNO3	MP81818	08/13/2024	01/04/2025	Mohan Bera	None	None	08/13/2024
								00/10/2024

<b>FROM</b>	1600.00000ml of M5613 + $800.00000$ ml of M5963 = $800.0000$ ml	Final Quantity: 3200.000 ml
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Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
65	POTASSIUM PERMANGANATE SOLUTION 5 %	MP81819	08/13/2024	02/13/2025		METALS_SCA LE_3 (M SC-3)		08/13/2024

**FROM** 100.00000gram of M4916 + 2000.00000ml of W3112 = Final Quantity: 2000.000 ml





**Metals STANDARD PREPARATION LOG** 

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
66	POTASSIUM PERSULFATE SOLUTION 5 %	MP81820	08/13/2024	02/13/2025		METALS_SCA LE_3 (M SC-3)		08/13/2024

FROM 100.00000ml of M4465 + 2000.00000ml of W3112 = Final Quantity: 2000.000 ml

<u>ME</u>	NO.	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
DIUM CHLORIDE - DROXYL- CHLORIDE	MP81821	08/13/2024	02/14/2025		METALS_SCA	None	08/13/2024
_	/L- CHLORIDE	/L- CHLORIDE	/L- CHLORIDE	/L- CHLORIDE	/L- CHLORIDE	/L- CHLORIDE   LE_3 (M SC-3)	/L- CHLORIDE LE_3 (M SC-3)

FROM SOLUTION 2000.00000ml of W3112 + 240.00000gram of M4251 + 240.00000gram of M4399 = Final Quantity: 2000.000 ml



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## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
170	1:1HCL	MP82127	09/03/2024	02/08/2025	Janvi Patel	None	None	09/03/2024
								09/03/2024

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP82134	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	09/04/2024

FROM 1.00000ml of M6034 + 2.50000ml of M5062 + 96.50000ml of W3112 = Final Quantity: 100.000 ml





## **Metals STANDARD PREPARATION LOG**

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1340	Hg 0.00 PPB STD	MP82135	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	

<b>FROM</b>	2.50000ml of M6034 + 247.50000ml of W3112 = Final Quantity: 250.000 ml
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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
1341			09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE	Sarabjit Jaswal
							TTE_5 (HG A)	09/04/2024

FROM 2.50000ml of M6034 + 247.30000ml of W3112 + 0.20000ml of MP82134 = Final Quantity: 250.000 ml





## **Metals STANDARD PREPARATION LOG**

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1342	Hg 2.5 PPB STD	MP82137	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	

<u>FROM</u>	2.50000ml of M6034 + 245.00000ml of W3112 + 2.50000ml of MP82134 = Final Quantity: 250.000 ml
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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1343	Hg 5.0 PPB STD		09/03/2024	09/04/2024	Mohan Bera	None	METALS_PIPE TTE_5 (HG A)	

FROM 2.50000ml of M6034 + 242.50000ml of W3112 + 5.00000ml of MP82134 = Final Quantity: 250.000 ml





## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1344	Hg 7.5 PPB STD	MP82139	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE 5 (HG A)	
	<u> </u>	<u> </u>					1 - 4 4 4 4 4	

FROM	2.50000ml of M6034 + 240.0000ml of W3112 + 7.50000ml of MP82134 = Final Quantity: 250.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1345	Hg 10.0 PPB STD	MP82140	09/03/2024	09/04/2024	Mohan Bera	None	METALS_PIPE	<b></b>
							TTE_5 (HG A)	09/04/2024

FROM 2.50000ml of M6034 + 237.50000ml of W3112 + 10.00000ml of MP82134 = Final Quantity: 250.000 ml





## **Metals STANDARD PREPARATION LOG**

<u>ID</u> N	NAME.	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1346 H	Hg ICV SOLUTION	MP82141	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	

FROM	2.50000ml of M5953	+ 2.50000ml of M6034	+ 245.00000ml of W3112	= Final Quantity: 250.000 ml
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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1351	ICB (Hg 0.00 PPB SOLUTION)	MP82142	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	

**FROM** 2.50000ml of M6034 + 247.50000ml of W3112 = Final Quantity: 250.000 ml



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## **Metals STANDARD PREPARATION LOG**

				<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1358 CCV (Hg 5.	0.0 PPB SOLUTION)	MP82143	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	

FROM	485.00000ml of W3112 + 5.00000ml of M6034 +	· 10.00000ml of MP82134	= Final Quantity: 500.000 ml

Recipe ID N	NAME	NO.	Prep Date	Expiration Date	<u>Prepared</u> By	ScaleID	<u>PipetteID</u>	Supervised By
		· <u></u>	09/03/2024	09/04/2024	Mohan Bera	None	METALS_PIPE	

**FROM** 495.00000ml of W3112 + 5.00000ml of M6034 = Final Quantity: 500.000 ml



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## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	MP82145	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	

FROM	2.50000ml of M6034 + 247.30000ml of W3112 + 0.20000ml of MP82134 = Final Quantity: 250.000 ml

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1350	CHK STD (Hg 7.0 PPB SOLUTION)	MP82146	09/03/2024	09/04/2024	Mohan Bera		METALS_PIPE TTE_5 (HG A)	

FROM 2.50000ml of M6034 + 240.50000ml of W3112 + 7.00000ml of MP82134 = Final Quantity: 250.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By  Mohan Bera
1122	ICPMS CALIB BLANK(S0/ICB/CCB)	MP82148	09/04/2024	09/27/2024	Sarabjit Jaswal	None	None	09/04/2024

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3880	M&B SPIKE-1	MP82149	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	
							TTE_3 (A)	09/04/2024

**FROM** 

5.00000ml of M5961 + 5.00000ml of M5962 + 5.00000ml of M5981 + 5.00000ml of M5982 + 5.00000ml of M5983 +

5.00000ml of M6023 + 5.00000ml of M6028 + 5.00000ml of M6030 + 35.00000ml of MP82148 = Final Quantity: 100.000 ml





**FROM** 

Metals STANDARD PREPARATION LOG

Recipe ID	NAME.	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By  Mohan Bera
3881	M&B SPIKE-2	MP82150	09/04/2024	09/22/2024	Sarabjit Jaswal	None	METALS_PIPE TTE_3 (A)	: 09/04/2024

10.00000ml of M4888 + 10.00000ml of M5976 + 12.50000ml of M5390 + 12.50000ml of M5515 + 12.50000ml of M5519 + 2.50000ml of M5799 + 2.50000ml of M5818 + 5.00000ml of M6033 + 30.00000ml of MP82148 = Final Quantity: 100.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3882	M&B SPIKE-3	MP82151	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>
							TTE_3 (A)	09/04/2024

FROM 0.62500ml of M5513 + 12.50000ml of M5697 + 12.50000ml of M5698 + 12.50000ml of M5819 + 11.87500ml of MP82148 = Final Quantity: 50.000 ml





**Metals STANDARD PREPARATION LOG** 

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By  Mohan Bera
3900	M&B SPIKE-4	MP82152	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE TTE_3 (A)	09/04/2024

FROM 6.25000ml of M5497 + 6.25000ml of M5769 + 6.25000ml of M5806 + 6.25000ml of MP82148 = Final Quantity: 25.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
4025	M&B SPIKE-5	MP82153	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	
							TTE_3 (A)	09/04/2024

FROM 15.00000ml of M5192 + 15.00000ml of M5978 + 20.00000ml of MP82148 = Final Quantity: 50.000 ml





### **Metals STANDARD PREPARATION LOG**

Recipe				Expiration	<u>Prepared</u>			Supervised By		
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera		
2902	S8 ICPMS	MP82155	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>		
							TTE_3 (A)	09/04/2024		
FROM 1.00000ml of M6033 + 2.50000ml of M5288 + 2.50000ml of M5515 + 5.00000ml of M5497 + 5.00000ml of M5769 +										

1.00000ml of M6033 + 2.50000ml of M5288 + 2.50000ml of M5515 + 5.00000ml of M5497 + 5.00000ml of M5806 + 79.0000ml of MP82148 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
68	STANNOUS CHLORIDE SOLUTION	MP82156	09/04/2024	09/05/2024	Mohan Bera	None	Glass Pipette-A	09/04/2024

FROM 450.00000ml of W3112 + 50.00000gram of M5882 + 50.00000ml of M6040 = Final Quantity: 500.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3947	S7(SFAM,6020,200.8)	MP82157	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>
							TTE_3 (A)	09/04/2024

**FROM** 

1.00000ml of M5799 + 1.00000ml of M5818 + 1.00000ml of M5981 + 1.00000ml of M5983 + 1.90000ml of M6033 + 10.00000ml of M5976 + 10.00000ml of M5978 + 10.00000ml of M6037 + 2.00000ml of M5815 + 2.00000ml of M5817 + 2.50000ml of M5476 + 4.00000ml of M5390 + 4.00000ml of M6025 + 4.90000ml of M5515 + 4.90000ml of M5519 + 5.00000ml of M6040 + 50.00000ml of M5304 + 828.10000ml of W3112 + 9.00000ml of M5697 + 9.00000ml of M5698 + 9.00000ml of M5819 + 9.90000ml of M5497 + 9.90000ml of M5769 + 9.90000ml of M5806 = Final Quantity: 1000.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3948	S6(SFAM,6020,200.8)	MP82158	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>
							TTE_3 (A)	09/04/2024

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 48.50000ml of W3112 + 50.00000ml of MP82157 = Final Quantity: 100.000 ml





**Metals STANDARD PREPARATION LOG** 

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By  Mohan Bera
3949	S5(SFAM,6020,200.8)	MP82159	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE TTE_3 (A)	

FROM	0.50000ml of M6040 +	- 1.00000ml of M6037 +	- 73.50000ml of W3112 + 25.00000ml of MP82157	= Final Quantity: 100.000 ml
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Recipe				<u>Expiration</u>	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3954	S4(SFAM,6020,200.8)	MP82160	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	ļ
							TTE_3 (A)	09/04/2024

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 86.00000ml of W3112 + 12.50000ml of MP82157 = Final Quantity: 100.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By  Mohan Bera
3951	S3(SFAM, 6020,200.8)	MP82161	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE TTE_3 (A)	09/04/2024

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 88.50000ml of W3112 + 10.00000ml of MP82158 = Final Quantity: 100.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3955	S2CONC(SFAM,6020,200.8)	MP82162	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>
							TTE_3 (A)	09/04/2024

### **FROM**

0.05000ml of M5476 + 0.05000ml of M5698 + 0.05000ml of M5798 + 0.05000ml of M5800 + 0.05000ml of M5801 +

0.05000ml of M5961 + 0.05000ml of M5981 + 0.05000ml of M5983 + 0.05000ml of M6023 + 0.05000ml of M6025 +

0.05000ml of M6028 + 0.05000ml of M6030 + 0.10000ml of M5658 + 0.10000ml of M5697 + 0.10000ml of M5802 +

0.10000ml of M6033 + 0.25000ml of M5227 + 0.25000ml of M5515 + 0.25000ml of M5799 + 0.25000ml of M5819 +

0.25000ml of M5962 + 0.25000ml of M5976 + 0.25000ml of M5978 + 0.50000ml of M5390 + 0.50000ml of M5818 +

1.25000ml of M5815 + 1.25000ml of M5817 + 2.50000ml of M5498 + 2.50000ml of M5519 + 2.50000ml of M5769 +

2.50000ml of M5806 + 2.50000ml of M6040 + 226.25000ml of W3112 + 5.00000ml of M6037 = Final Quantity: 250.000 ml





## **Metals STANDARD PREPARATION LOG**

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3956	S2(SFAM,6020,200.8)	MP82163	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>
							TTE_3 (A)	09/04/2024
							112_0 (71)	00/01/2021

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 98.00000ml of W3112 + 0.50000ml of MP82162 = Final Quantity: 100.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3957	S1(SFAM,6020,200.8)	MP82164	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>
							TTE_3 (A)	09/04/2024

FROM 0.50000ml of M6040 + 1.00000ml of M6037 + 88.50000ml of W3112 + 10.00000ml of MP82163 = Final Quantity: 100.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By  Mohan Bera
3959	ICV(6020,200.8)	MP82165	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE TTE_3 (A)	09/04/2024

FROM 0.05000ml of M5218 + 0.05000ml of M5981 + 0.05000ml of M5982 + 0.05000ml of M5983 + 0.45000ml of M5192 + 0.45000ml of M5545 + 2.00000ml of M5295 + 96.90000ml of MP82148 = Final Quantity: 100.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3961	CCV	MP82166	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	
							TTE_3 (A)	09/04/2024

**FROM** 

 $0.20000 \text{ml of M5513} + 0.50000 \text{ml of M5799} + 0.50000 \text{ml of M5818} + 0.50000 \text{ml of M5981} + 0.50000 \text{ml of M5983} + \\ 1.00000 \text{ml of M5815} + 1.00000 \text{ml of M5817} + 1.25000 \text{ml of M5476} + 10.00000 \text{ml of M6037} + 12.45000 \text{ml of M5515} + \\ 12.45000 \text{ml of M5519} + 2.00000 \text{ml of M5390} + 24.95000 \text{ml of M5498} + 24.95000 \text{ml of M5769} + 24.95000 \text{ml of M5806} + \\ 25.00000 \text{ml of M5304} + 4.50000 \text{ml of M5697} + 4.50000 \text{ml of M5698} + 4.50000 \text{ml of M5819} + 4.95000 \text{ml of M6033} + \\ 5.00000 \text{ml of M6040} + 5.50000 \text{ml of M5976} + 5.50000 \text{ml of M5978} + 823.45000 \text{ml of W3112} = \text{Final Quantity: } 1000.000 \text{ ml}$ 



Aliance

Fax: 908 789 8922

## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By  Mohan Bera
1142			09/04/2024		Sarabjit Jaswal	None	METALS_PIPE	Ē
							TTE_3 (A)	09/04/2024

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
1143	ICSAB ICPMS	MP82168	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<u> </u>
							TTE_3 (A)	09/04/2024

FROM 0.00500ml of M5799 + 0.00500ml of M5981 + 0.00500ml of M5982 + 0.00500ml of M5983 + 10.00000ml of M5873 + 10.00000ml of M5874 + 79.98000ml of MP82148 = Final Quantity: 100.000 ml





**Metals STANDARD PREPARATION LOG** 

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By  Mohan Bera
3962	MG 10PPM FOR TUNE	MP82192	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE TTE_3 (A)	09/04/2024

**FROM** 0.01000ml of M5769 + 9.99000ml of MP82148 = Final Quantity: 100.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3894	TUNE 200PPB	MP82193	09/04/2024	09/27/2024	Sarabjit Jaswal	None	METALS_PIPE	<b></b>
							TTE_3 (A)	09/04/2024

FROM 2.00000ml of M6055 + 2.00000ml of MP82192 + 96.00000ml of MP82148 = Final Quantity: 100.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID 3903	NAME ISS 3PPM	NO. MP82194	Prep Date 09/04/2024	Expiration Date 09/27/2024	<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	PipetteID METALS_PIPE TTE_3 (A)	Supervised By  Mohan Bera  09/04/2024
FROM	5.00000ml of M6037 + 75.00000ml o	f M5739 + 1	70.00000ml c	of MP82148 =	Final Quantity: 2	50.000 ml		



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	12/19/2018 / mohan	12/05/2018 / mohan	M4251
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000187425	08/16/2024	08/16/2019 / RICHARD	07/08/2019 / RICHARD	M4399
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3238-05 / Potassium Persulfate (2.5kg)	0000234156	08/06/2025	07/23/2019 /Jaswal	07/25/2019 / manojkumar	M4465
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57022 / Ti, 1000 PPM, 125 ml	070721	09/22/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4888
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3227-05 / Potassium Permanganate (2.5kg)	210800	03/31/2026	11/30/2022 / mohan	07/28/2021 / mohan	M4916
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
			1	1		



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	051722	05/17/2025	07/01/2022 / bin	06/17/2022 / jaswal	M5192
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	S2-MEB711674	11/02/2026	07/01/2022 / bin	09/10/2021 / bin	M5218
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	100121	10/01/2024	07/01/2022 / bin	10/18/2021 / bin	M5227
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	071122	07/11/2025	09/01/2022 / jaswal	07/21/2022 / jaswal	M5288
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	02/05/2025	08/07/2024 / jaswal	02/20/2020 / bin	M5295
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened /	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.	57056 / Ba, 1000 PPM, 125 ml	072122	07/21/2025	08/07/2024 / jaswal	09/18/2022 / bin	M5390
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	08/09/2025	07/29/2024 /Jaswal	03/16/2023 / jaswal	M5476
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	03/18/2023 / bin	03/17/2023 / bin	M5497
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5498
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened /	Received Date /	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 /	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	092122	09/21/2025	08/01/2024 / Jaswal	03/17/2023 / bin	M5515



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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.	57022 / Titanium (Ti) 1000PPM	050223	05/02/2026	05/08/2023 / jaswal	05/08/2023 / jaswal	M5545
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Seidler Chemical	BA-9673-33 / Sulfuric Acid, Instra-Analyzed (cs/6c2.5L)	0000265056	11/05/2025	07/13/2023 / mohan	07/07/2023 / mohan	M5613
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 /	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 /	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	102623	10/26/2026	04/18/2024 / jaswal	10/27/2023 / jaswal	M5698



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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.	58112 / Mg, 10000 PPM, 500 ml	091823	09/18/2026	05/24/2024 / Jaswal	01/03/2024 / bin	M5769
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	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 /	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 /	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 /	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 /	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 /	Chemtech
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 /	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	122023	12/20/2026	03/06/2024 / jaswal	02/09/2024 / jaswal	M5818
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened /	Received Date /	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 #
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 /	Chemtech Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	232820	08/31/2028	04/30/2024 / mohan	04/25/2024 / mohan	M5882
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
EPA	ICV-5 / ICV (HG)STOCK SOLN	ICV5-0415	01/01/2025	07/01/2024 / mohan	03/30/2023 / mohan	M5953
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	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 /	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 #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24B1362001	01/04/2025	07/09/2024 / Al-Terek	07/03/2024 / Al-Terek	M5963
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	CGTI1-1 / TITANIUM 125mL 1000ug/mL	T2-TI719972	06/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5978
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	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 /	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	031524	03/15/2027	07/01/2024 / Jaswal	06/11/2024 / Jaswal	M5982
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	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 #
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	06/12/2027	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	01/25/2019 / Jaswal	M6028
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened /	Received Date /	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 /	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58113 / AI, 10000 PPM, 500 ml	011623	01/16/2026	08/07/2024 / Jaswal	01/03/2024 / Jaswal	M6033
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened /	Received Date /	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	02/01/2025	08/06/2024 / Janvi	08/01/2024 / Janvi	M6034



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	02/02/2025	08/24/2024 / Janvi	08/01/2024 / Janvi	M6037

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	24D1562005	02/08/2025	08/09/2024 /Janvi	08/01/2024 / Janvi	M6040
	(cs/6x2.5L)					

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	DIW / DI Water	Daily Lab-Certified	07/03/2029	07/03/2024 / Iwona	07/03/2024 / Iwona	W3112





1 Reagent Lane Fair Lawn, NJ 07410 201,796,7100 tel

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System

Standard ISO9001:2015 by SAI Global Certificate Number CERT - 0120633 201,796,1329 fax

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

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

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

Harout Sahagian - Quality Control Supervisor - Fair Lawn

Sulfuric Acid
BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis Low Selenium





M 56 3

Material No.: 9673-33 Batch No.: 0000265056 Manufactured Date: 2020/05/12 Retest Date: 2025/05/11

Revision No: 1

# Certificate of Analysis

Test	Specification	Result
ACS - Assay (H <sub>2</sub> SO <sub>4</sub> )	95.0 - 98.0 %	96.5
Appearance	Passes Test	PT
ACS - Color (APHA)	<= 10	5
ACS - Residue after Ignition	<= 3 ppm	< 1
ACS - Substances Reducing Permanganate (as SO2)	<= 2 ppm	< 2
Ammonium (NH <sub>4</sub> )	<= 1 ppm	< 1
Chloride (CI)	<= 0.1 ppm	< 0.1
Nitrate (NO3)	<= 0.2 ppm	< 0.1
Phosphate (PO4)	<= 0.5 ppm	< 0.1
Trace Impurities – Aluminum (AI)	<= 30.0 ppb	< 0.2
Arsenic and Antimony (as As)	<= 4 ppb	< 2
Trace Impurities – Barium (Ba)	<= 10.0 ppb	< 1.0
Trace Impurities – Beryllium (Be)	<= 10.0 ppb	< 1.0
Frace Impurities - Bismuth (Bi)	<= 10.0 ppb	< 1.0
Frace Impurities – Boron (B)	<= 10.0 ppb	< 5.0
Trace Impurities - Cadmium (Cd)	<= 2.0 ppb	< 0.3
Frace Impurities – Calcium (Ca)	<= 50.0 ppb	< 1.0
Frace Impurities – Chromium (Cr)	<= 6.0 ppb	< 0.4
Frace Impurities - Cobalt (Co)	<= 0.5 ppb	< 0.3
race Impurities - Copper (Cu)	<= 1.0 ppb	< 0.1
race Impurities – Gallium (Ga)	<= 10.0 ppb	< 1.0
race Impurities – Germanium (Ge)	<= 10.0 ppb	< 10.0
race Impurities – Gold (Au)	<= 10.0 ppb	< 0.2
Heavy Metals (as Pb)	<= 500 ppb	< 100

Material No.: 9673-33 Batch No.: 0000265056

Test	Specification	Result	
Trace Impurities - Iron (Fe)	<= 50.0 ppb	3.3	
Trace Impurities - Lead (Pb)	<= 0.5 ppb	< 0.5	
Trace Impurities - Lithium (Li)	<= 10.0 ppb	< 1.0	
Trace Impurities - Magnesium (Mg)	<= 7.0 ppb	< 0.2	
Trace Impurities – Manganese (Mn)	<= 1.0 ppb	< 0.4	
Trace Impurities – Mercury (Hg)	<= 0.5 ppb	< 0.1	
Trace Impurities – Molybdenum (Mo)	<= 10.0 ppb	< 5.0	
Trace Impurities – Nickel (Ni)	<= 2.0 ppb	< 0.3	
Trace Impurities – Niobium (Nb)	<= 10.0 ppb	< 1.0	
Trace Impurities – Potassium (K)	<= 500.0 ppb	< 2.0	
Trace Impurities – Selenium (Se)	<= 50.0 ppb	17.8	
Trace Impurities – Silicon (Si)	<= 100.0 ppb	< 10.0	
Trace Impurities – Silver (Ag)	<= 1.0 ppb	< 0.3	
Trace Impurities – Sodium (Na)	<= 500.0 ppb	1.5	
Trace Impurities – Strontium (Sr)	<= 5.0 ppb	< 0.2	
Trace Impurities – Tantalum (Ta)	<= 10.0 ppb	< 5.0	
Trace Impurities – Thallium (TI)	<= 20.0 ppb	< 5.0	
Trace Impurities – Tin (Sn)	<= 5.0 ppb	< 0.8	
Frace Impurities – Titanium (Ti)	<= 10.0 ppb	< 1.0	
Frace Impurities – Vanadium (V)	<= 10.0 ppb	< 1.0	
race Impurities – Zinc (Zn)	<= 5.0 ppb	0.4	
Frace Impurities – Zirconium (Zr)	<= 10.0 ppb	< 1.0	

For Laboratory, Research or Manufacturing Use

Country of Origin:

US

Packaging Site:

Phillipsburg Mfg Ctr & DC



Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



# Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

**Expiration Date:** 

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Aligan Prance

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

**SDS Information** 

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

**NIST** SRM

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

1 of 2

## Certified Reference Material CRM



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

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

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<li>(T) = Target analyte</li>	<b>40.02</b>	40.02	40.2	<0.02	<b>40.01</b>	20.02		40.02		Verifica	
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yte	802	40.02	<0.02	<0.02	<0.02	<0.02	0.00	<0000		by ICP-	
	Sc	Sm	Ru	RЬ	R	Re	1	P.		NS (	
	<b>40.02</b>	40.02	40.02	40.02	<0.02	<0.02	40.02	000		ug/mL)	
	Ta	S	Sr	Z	Age	8	č	S	200000000		
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	11	Sn	Tm	Ħ	Ħ	Te	10				
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	Zt	Zn	ĸ	뀾	<	U	*	THE PERSON NAMED IN COLUMN 1			
	<0.02	<0.02	40.02	<0.02	40.02	40,02	20.02				

### Physical Characterization:

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

Certified by:

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

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

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

### 800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



## Certified Reference Material CRM

R: 8/5/24

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

CERTIFIED WEIGHT REPORT:

Part Number: 57182

Solvent:

24002546

Nitric Acid

Lot#

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

Revenue

1 40.0

Description: Lot Number: 110923 Lead (Pb)

Recommended Storage: **Expiration Date:** 110926 Ambient (20 °C)

Nominal Concentration (µg/mL): NIST Test Number: **6UTB** 10000

Weight shown below was diluted to (mL): Cot 2000.02 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target

IN029 PBD122016A1 RW# Number Conc. (µg/mL) 10000 99.999 38 Purity (%) 0.10 62.5 **3** 32.0006 Weight (g) 32.0040 Weight (g) Conc. (µg/mL) 10001.1 20.0 10099-74-8 0.05 mg/m3 intryns-rat 93 mg/kg 3128

Actual Actual

Uncertainty Expanded

Reviewed By:

Pedro L. Rentas

110923

+/- (µg/mL) CAS#

OSHA PEL (TWA) SDS information

# OSHA PEL (TWA) LD50 TSIN SRM

 Lead(II) nitrate (Pb) 1.0E7 [1] Spectrum No.1 [ 17.284 sec]:58182.D# [Count] [Linear]



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

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

			_		20.02	2	70.02
					3	?	3
<0.02 Pt					40.02	S	40.02
					40.02	, t	20.01
					A.12	S	20.02
			_		A0.02	, E	8 2
					<b>A</b>	<u></u>	20.02
					40.02	. E	20.02
7 7 Z S Z 3	40.02 40.02 40.02	Mg 40.02  Hg 40.02  Hg 40.02	40.02 Lu 40.02 40.02 Mg 40.01 40.02 Mg 40.02 40.02 Mg 40.02	Ho 4002 Lu 4002 Li 4002 Mg 4001 Li 4002 Mg 4001 Li 4002 Mg 402 Fe 402 Hg 402	40.02 Lu 40.02 40.02 Mg 40.01 40.02 Mg 40.02 40.02 Mg 40.02	4002 Ho 4002 Lu 4002 4002 In 4002 Mg 4001 4002 Fe 402 Hg 402	Er 4002 Ho 4002 Lu 4002 Eu 4002 In 4002 Mg 4001 Gd 4002 Ir 4002 Mn 4002 Ga 4002 Fe 402 Hg 402

### Physical Characterization:

(T)= Target analyte

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

Son I Mills

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
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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).

### Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent

Suitable for Mercury Determination (hydroxylammonium chloride)

MY251





Material No.: 2196-01 Batch No.: 0000215387

Manufactured Date: 2018/06/27

Retest Date: 2025/06/25 Revision No: 1

### Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Test	Specification	Result
Assay (NH2OH+HCl) (by KMnO4 titrn)	>= 96.0 %	99.1
Clarity of Alcohol Solution	Passes Test	PT
Residue after Ignition	<= 0.050 %	0.017
Titrable Free Acid (meq/g)	<= 0.25	0.19
Ammonium (NH4)	Passes Test	PT
Sulfur Compounds (as SO4)	<= 0.005 %	< 0.003
Trace Impurities – ACS – Heavy Metals (as Pb)	<= 5 ppm	4
Trace Impurities – Iron (Fe)	<= 5 ppm	< 3
Trace Impurities – Mercury (Hg)	<= 0.050 ppm	< 0.005

For Laboratory, Research or Manufacturing Use

Country of Origin:

CN

Packaging Site:

Paris Mfg Ctr & DC



Phillipsburg, NJ 9001:2015, FSSC22000
Paris, KY 9001:2008
Mexico City, Mexico 9001:2008
Gliwice, Poland 9001:2015, 13485:2012
Selangor, Malaysia 9001:2008
Dehradun, India, 9001:2008, 14001:2004, 13485:2003
Mumbai, India, 9001:2015, 17025:2005
Panoli, India 9001:2015

James Tethier
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

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





M4399 Supplud - 07.08.19

Material No.: 3624-05 Batch No.: 0000187425 Manufactured Date: 2017/08/03

Retest Date: 2024/08/01

### Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Test	Specification	Result
Assay (NaCl) (by Ag titrn)	>= 99.0 %	99.8
pH of 5% Solution at 25°C	5.0 - 9.0	5.8
ACS – Insoluble Matter	<= 0.005 %	0.003
lodide (I)	<= 0.002 %	< 0.002
Bromide (Br)	<= 0.01 %	< 0.01
Chlorate and Nitrate (as NO3)	<= 0.003 %	< 0.003
ACS – Phosphate (PO <sub>4</sub> )	<= 5 ppm	< 5
Sulfate (SO <sub>4</sub> )	<= 0.004 %	< 0.004
Barium (Ba)	Passes Test	PT
ACS - Heavy Metals (as Pb)	<= 5 ppm	< 5
Iron (Fe)	<= 2 ppm	< 2
Calcium (Ca)	<= 0.002 %	< 0.002
Magnesium (Mg)	<= 0.001 %	< 0.001
Potassium (K)	<= 0.005 %	< 0.005

For Laboratory, Research or Manufacturing Use Meets Reagent Specifications for testing USP/NF monographs

Country of Origin:

Packaging Site:

Paris Mfg Ctr & DC

PS 08-16-19



Phillipsburg, NJ 9001:2008, 14001:2004, FSSC 22000 Paris, KY 9001:2008 Mexico City, Mexico 9001:2008 Deventer, The Netherlands 9001:2008, 14001:2004, 13485:2003 Gliwice, Poland 9001:2008, 13485:2012 Selangor, Malaysia 9001:2008 Dehradun, India, 9001:2008, 14001:2004, 13485:2003 Mumbai, India, 9001:2008

James Techie Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.573.2600 Avantor Performance Materials, LLC.

3477 Corporate Parkway. Center Valley, PA 18034. U.S.A. Phone: 610.573.2600 . Fax: 610.573.2610

## **Absolute Standards, Inc.** 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Volume shown below was diluted to (mL): NIST Test Number: **Expiration Date:** Part Number: **Lot Number:** Description: 070724 1000 57022 070721 Ambient (20 °C) Titanium (Ti) 2000.02 0.058 5E-05 Flask Uncertainty Balance Uncertainty 20370011 Lot # 2.0% Nitric Acid Solvent: (mL) 40.0 Nitric Acid Formulated By: Reviewed By: Expanded Pedro L. Rentas ento Lawrence Barry SDS Information 070721 070721

1. Ammonium hexafluorotitanate (Ti)

58122

070120

0.1000

200.0

0.084

1000

10000.1

1000.0

2.2

16962-40-6

2.5 (F) mg/m3

Κ

3162a

Compound

Number

Number Lot

Vol. (mL)

Pipette

Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/mL) Uncertainty

CAS#

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

LD50

NIST SRM

Final

Part

Dilution Factor

Initial

Uncertainty

Nominal

m/x>	2.507	5.0E7	1.0E8-	2.0E8	5.0E4-	1.0E5
מ		110		10		
N N O		120		20		
230		130		30		
040		140		40		
250		150		50		
ν 60		160		60		
		170 1		70		
		180 19		9		
		190 200		90 100		

www.absolutestandards.com



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

							Trace M	<b>letals</b>	Verifica:	tion	oy ICP-N	ir) SV	₃/mL)						
Al	< 0.02	Cd	< 0.02	Dy	<0.02	Ή	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	ф	<0.02	W	< 0.02
Sb	<0.02	Ca	<0.2	땹	<0.02	Но	<0.02	Lu	<0.02	В	<0.02	Re	<0.02	S:	<0.02	Te	<0.02	U	<0.02
As	40.2	Се	<0.02	Eu	<0.02	Ín	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	TI	<0.02	<	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	ŀ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Υь	<0.02
Ве	<0.01	Cr	< 0.02	Ga	<0.02	Fe	<0.2	$_{ m Hg}$	<0.2	P	< 0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Со	<0.02	Ge	<0.02	La	<0.02	Мо	<0.02	Ρt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	<0.02	Au	<0.02	Рь	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	Τ	Zr	< 0.02
									) I										

(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.
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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).



M4913- 16



### Certificate of Analysis

1 Reagent Lane Fair Lawn, NJ 07410 201.796.7100 tel 201.796.1329 fax

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632

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

Catalog Number	P279	Quality Test / Release Date	01/12/2021
Lot Number	210306		
Description	POTASSIUM PERMANGANATE, A.C.S.	The second secon	
Country of Origin	United States	Suggested Retest Date	Jan/2026

N/A			
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Dark purple to purple green crystals
ASSAY	%	>= 99	99.3
CHLORIDE & CHLORATE	%	<= 0.005	<0.005
IDENTIFICATION	PASS/FAIL	= PASS TEST	pass test
INSOLUBLE MATTER	%	<= 0.2	<0.2
MERCURY (Hg)	ppm	<= 0.05	<0.004
SULFATE (SO4)	%	<= 0.02	<0.02

Julian Burton

Julian Burton - Quality Control Manager - Fair Lawn



### Certificate of Analysis

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

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Mass Spec Solution

Catalog Number:

MSHG-10PPM

Lot Number:

S2-HG709270

Matrix:

10% (v/v) HCI

Value / Analyte(s):

10 μg/mL ea:

Mercury

Starting Material:

Hg metal

Starting Material Lot#:

1959

Starting Material Purity:

99.9994%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

 $10.001 \pm 0.053 \,\mu g/mL$ 

Density:

1.020 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
Ha	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<sub>CRM/RM</sub>, where two or more methods of characterization are used is the weighted mean of the results:

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

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

w<sub>i</sub> = the weighting factors for each method calculated using the inverse square of

the variance.

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

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

k = coverage factor = 2

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

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

X<sub>CRM/RM</sub> = (X<sub>a</sub>) (u<sub>char a</sub>)

Xa = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = U<sub>CRM/RM</sub> = k (u<sup>2</sup>char a + u<sup>2</sup>bb + u<sup>2</sup>lts + u<sup>2</sup>ts) 1/2

k = coverage factor = 2

u<sub>char a</sub> = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

```
O Ag
          0.000011 M Eu <
                            0.000201 O Na
                                              0.000004 M Se <
                                                               0.015915 O Zn <
                                                                                 0.001510
0
   Al
          0.000001 O Fe
                            0.000001 M Nb <
                                              0.000201 O Si
                                                                0.000005 M Zr <
                                                                                 0.000201
M
   As <
          0.000402 M Ga <
                            0.000201 M Nd <
                                              0.000201 M Sm <
                                                               0.000201
M
   Au <
          0.003631 M Gd <
                            0.000201 M Ni <
                                              0.000402 M
                                                        Sn <
                                                               0.001007
M
   B <
          0.001208 M
                    Ge <
                            0.000201 M Os <
                                              0.000605 M
                                                        Sr <
                                                               0.000201
M Ba <
          0.000201 M Hf <
                            0.000201 O P <
                                              0.032370 M
                                                        Ta <
                                                               0.000201
M
  Be <
          0.000201 s
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                    Hq <
                                              0.000201 M Tb <
                                                               0.000201
M Bi <
          0.000201 M
                    Ho <
                            0.000201 M Pd <
                                              0.000403 M
                                                        Te <
                                                               0.002216
0
  Ca
          0.000007 M In <
                            0.000201 M Pr <
                                              0.000201 M Th <
                                                               0.000201
M
  Cd <
          0.000201 M Ir
                            0.000201 M
                                      Pt <
                                              0.000402 M Ti <
                                                               0.000402
                                              0.000201 O TI <
M
  Ce <
          0.000201 O K
                            0.000020 M
                                      Rb <
                                                               0.016508
  Co <
M
          0.000201 M La <
                            0.000201 M
                                      Re <
                                              0.000201 M Tm <
                                                               0.000201
  Cr <
0
          0.003021 O Li <
                            0.000107 M
                                      Rh <
                                              0.000201 M U <
                                                               0.008058
M
  Cs <
          0.001208 M Lu <
                            0.000201 M Ru <
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M Er <
          0.000201 M Mo
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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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

September 22, 2021

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

### 11.2 Lot Expiration Date

- September 22, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

Sealed TCT	Bag	Open Date	:		

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

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

Uyen Truong
Supervisor, Product Documentation

Mya Truong

### Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Booth

### Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Laines

## Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

M.5192 R: 06/17/2

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

CERTIFIED WEIGHT REPORT: Ammonium molybdate (Mo) Compound Nominal Concentration (µg/mL): m/z-> M/z-> Recommended Storage: m/z-> Volume shown below was diluted to (mL): 2.0E6 1.0E6 1.0E5 2.0E5 2000 1000 **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 58142 Number Part **BTU9** 1000 57042 Ambient (20 °C) 051722 051725 Molybdenum (Mo) 022222 Fot 120 220 20 [ 8.594 sec]:57042.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 230 30 5E-05 300.0 Vol. (mL) 0.058 Initial Flask Uncertainty Balance Uncertainty Pipette (mL) Conc. (µg/mL) Uncertainty 0.084 240 140 40 MKBQ8597V Ammonium hydroxide Nominal Lot # 0.5% 1000 250 150 50 Conc. (µg/mL) 10001.0 Initial (III) 15.0 160 260 60 Conc. (µg/mL) Ammonium hydroxide 1000.0 Final 170 70 Formulated By: Reviewed By: Uncertainty +/- (µg/mL) Expanded 2.1 180 80 13106-76-8 (Solvent Safety Info. On Attached pg.) Lawrence Barry OSHA PEL (TWA) Pedro L. Rentas 5 mg(Mo)/m3 190 90 SDS Information 200 100 orl-rat 333 mg/kg 051722 051722 3134 SRM TSIN

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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 Spectroscopy (ICP-MS):

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### 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).



### Certificate of Analysis

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CHEM-QC-4

Lot Number: S2-MEB711674

Matrix: 3% (v/v) HNO3
 3% (v/v) HF

3 /0 (V/V) I II

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

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

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Boron, B  $1\,000\pm7\,\mu\text{g/mL}$  Molybdenum, Mo  $1\,000\pm5\,\mu\text{g/mL}$  Silicon, Si  $1\,000\pm7\,\mu\text{g/mL}$  Tin, Sn  $1\,000\pm5\,\mu\text{g/mL}$ 

Titanium, Ti  $1 001 \pm 6 \mu g/mL$ 

**Density:** 1.032 g/mL (measured at 20  $\pm$  4 °C)

### **Assay Information:**

ANALYTE	METHOD	NIST SRM#	SRM LOT#
В	ICP Assay	3107	110830
Мо	ICP Assay	3134	130418
Si	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

November 02, 2021

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

### 11.2 Lot Expiration Date

- November 02, 2026

- Sealed TCT Rag Open Date:

- 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

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This CDM/DM should not be us	and langer than one year (or give	months in the case	of a 20 m

- Inis 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.

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Director, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

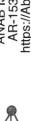
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Certified Reference Material CRM

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## Certified Reference Material CRM



Absolute Standards, Inc.

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800-368-1131



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

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(T)= Target analyte

### Physical Characterization:

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



Certified by:

the preparation of all standards.

<sup>\*</sup> 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.

<sup>\*</sup> All standard containers are meticulously cleaned prior to use.

<sup>\*</sup> 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.

<sup>\*</sup> All Standards should be stored with caps tight and under appropriate laboratory conditions.

<sup>\*</sup> 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).

3

Certified Reference Material CRM

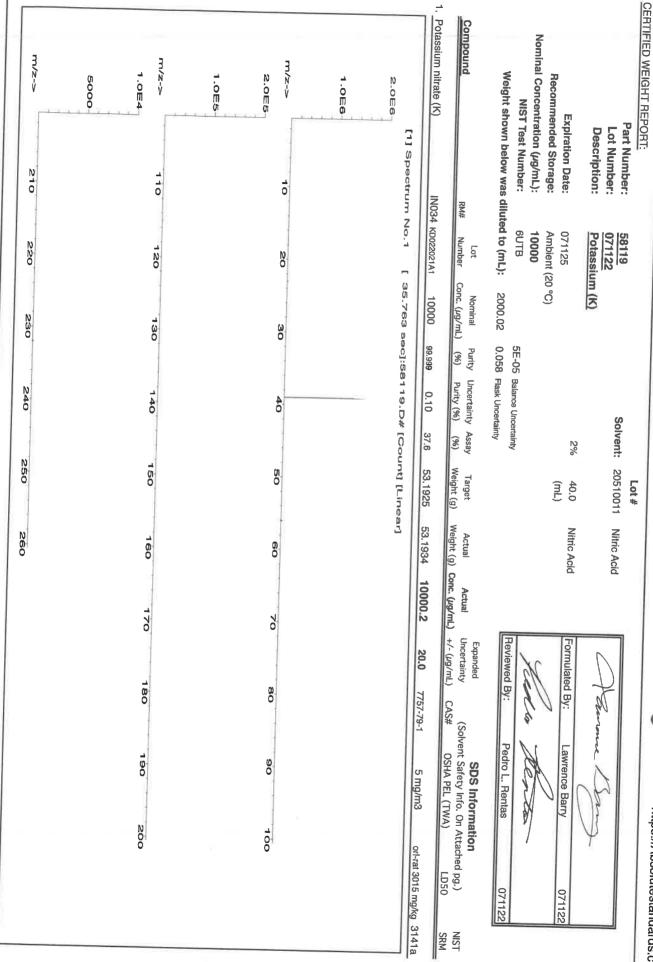
www.absolutestandards.com

800-368-1131

Absolute Standards, Inc.



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



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

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

Physical Characterization:	Al <0.02 Cd <0.02 Dy Sb <0.02 Ca <0.02 Er As <0.2 Ce <0.02 En Ba <0.02 Cs <0.02 Gd Be <0.01 Cr <0.02 Ga Bi <0.02 Cu <0.02 Ga Bi <0.02 Cu <0.02 Ga	
23 10.02 4	<0.022         Hf         <0.022         Li         <0.022         Ni         <0.022         Pr         <0.023         Se         <0.22         Tb         <0.022         W         <0.022           <0.022	Trace Metals Verification by ICP-MS (ug/ml)

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.

\* 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).

 $^{\star}$  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 # 58119



### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R: 4120/21

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

These instructions are for advisory purposes only. If any apparent conflict exists between these 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 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 µg/L (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014

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

Page 1 of 2



RMs ICV 1, 5, 6 SFAM.docx



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

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

ICV1-1014

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

ICV5-0415

For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and 5% (v/v) nitric acid.

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K<sub>3</sub>Fe(CN)<sub>6</sub>, 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)
Al	2500	500
Sb	1000	200
As	1000	200
Ba	520	100
Be	510	100
Cd	510	100
Ca	10000	2000
Cr	520	100
Co	520	100
Cu	510	100
Fe	10000	2000
Pb	1000	200
Mg	6000	1200
Mn	520	100
Ni	530	110
K	9900	2000
Se	1000	200
Ag	250	50
Na	10000	2000
Ti	1000	210
V	500	100
Zn	1000	200

	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



### 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: 6020CAL-1

Lot Number: S2-MEB711244

Matrix: 5% (v/v) HNO3

tr. HF

Value / Analyte(s): 20 µg/mL ea:

Silver, Aluminum, Arsenic, Barium, Beryllium, Calcium, Cadmium, Cobalt, Chromium, Copper, Potassium, Iron, Magnesium, Manganese, Sodium, Nickel, Lead, Antimony, Selenium, Thallium, Zinc Vanadium,

### 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

### **Assay Information:**

58	say information:			
	ANALYTE	METHOD	NIST SRM#	SRM LOT#
	Ag	ICP Assay	3151 999c	160729
	Ag	Volhard		999c
	Al	ICP Assay	3101a	140903
	Al	EDTA	928	928
	As	ICP Assay	3103a	100818
	Ba	ICP Assay	3104a	140909
	Ba	Gravimetric	2405-	See Sec. 4.2
	Be	ICP Assay	3105a	090514
	Ca	ICP Assay	3109a	130213
	Ca	EDTA	928	928
	Cd	ICP Assay	3108	130116
	Cd	EDTA	928	928
	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
	K	ICP Assay	3141a	140813
	K	Gravimetric		See Sec. 4.2
	Mg	ICP Assay	3131a	140110
	Mg	EDTA	928	928
	Mn	ICP Assay	3132	050429
	Mn	EDTA	928	928
	Na	ICP Assay	3152a	120715
	Na	Gravimetric		See Sec. 4.2
	Ni	ICP Assay	3136	120619
	Ni	EDTA	928	928
	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
	TI	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 Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where two or more methods of characterization are Certified Value, X<sub>CRM/RM</sub>, where one method of characterization used is the weighted mean of the results: is used is the mean of individual results: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub> Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u<sub>char a</sub> = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u<sub>char a</sub> = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) u<sub>lts</sub> = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u<sub>ts</sub> = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

**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; inorganic ventures.com; info@inorganic ventures.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: <sub>-</sub>	
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- 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.

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Director, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

Paul R Laines

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number:

57056

Solvent:

20510011

Nitric Acid

200

40.0

Nitric Acid

Description: Lot Number:

072122 Barium (Ba)

Certified Reference Material CRM

Riograph 33

Lot #

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

Formulated By: Liovannie Giovanni Esposito appeal 2

072122

Reviewed By: Pedro L. Rentas 072122

IN023 BAD022019A1 RM# Number 5 Conc. (µg/mL) Nominal 1000 99.999 Purity 8 Uncertainty Assay Purity (%) 0.10 52.3 <u>8</u> Weight (g) 3.82417 Target Weight (g) Conc. (µg/mL) 3.82426 Actual 1000.0 Actual +/- (µg/mL) Uncertainty Expanded 2.0 10022-31-8 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SDS Information 0.5 mg/m3 orl-rat 355 mg/kg 3104a SRM TSIN

1. Barium nitrate (Ba)

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 072125

**NIST Test Number:** 

Recommended Storage:

**Expiration Date:** 

Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

m/z-> **1/2-**2 17/2-Y 2.5E6 5.0E6 2.0E5 1.0ES 2.0E6 1.OE6 [1] Spectrum No.1 210 110 0 220 120 N O [ 12.514 sec]:58156.D# [Count] [Linear] 130 230 30 140 240 4 250 150 Ö. 160 260 00 170 8 180 80 190 90 200 100

## 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):

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A	4	,	100	i	100	2	70.00	7	70.0>	D.	70.02	2	40.02	2	<0.02	E .	<0.05	ם	<0.02
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Be	<0.01	Ö	<0.02	Ğ	<0.02	Ę.	<0.2	Ho	<0.2	۵	200	å	6	į,	1 6	Ę	0.00	; ;	70:05
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1			2010		7000	7 0	70.05	DAT	Z0:0>	4	787	S	<0.02	2	202	Ë	200	,	5000

Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

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

<sup>\*</sup> 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).

<sup>\*</sup> All Standards should be stored with caps tight and under appropriate laboratory conditions. Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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

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



ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com 031523 031523 Giovanni Esposito Pedro L. Rentas Liovanni Formulated By: Reviewed By: Certified Reference Material CRM Nitric Acid Nitric Acid Solvent: 21110221 Lot # 60.0 (mL) % 5E-05 Balance Uncertainty 0.058 Flask Uncertainty 3000.41 Ambient (20 °C) Calcium (Ca) Weight shown below was diluted to (mL): 031523 031526 10000 **6UTB** Recommended Storage: Nominal Concentration (µg/mL): Part Number: Lot Number: Description: **Expiration Date:** NIST Test Number: CERTIFIED WEIGHT REPORT:

Compound	RM#	Lot Number	Nominal Purity Conc. (µg/mL) (%)	Punty (%)	Purity Uncertainty Assay (%) Purity (%) (%)		Target Weight (g)	Actual Weight (g)	Expanded Actual Actual Uncertainty (Sc Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS#	Expanded Uncertainty +/- (ug/mL)	(Solv	SDS Information (Solvent Safety Info. On Attached pg.)  NS# OSHA PEL (TWA) LD50	Attached pg.) LD50	NIST
1. Calcium carbonate (Ca)	IN014	INO14 caboragezat	10000 99.999	666.66	0.10	38.9	75.1990	75.2093	10001.4	20.0	471-34-1	5 mg/m3	ort-rat	3109a
[1] S <sub>1</sub>	[1] Spectrum No.1		4.00	8ec]:6	12.514 sec]:58120.D# [Count] [Linear]	<u> </u>	unti (Line	ari						
1.0E4														
m/z->	0	.0		000	.0	400400	0	0	2		0		001	
2. 4 4														
m/z->	0	120		90	140		150	160	071	0	180	190		
6.0E4														
m/z->	019	220		230	240		250	260						





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

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

					•	Trace Me	tals	Verificat	<u>io</u>	by ICP-A	MS (	$(ng/m\Gamma)$		r				
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707	ප	<0.02	δ'n	<b>40.02</b>	H	<0.02	II.	<0.02	Z	<0.02	F	<0.02	Se	<0.2	13	<0.02	≱	<0.02
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707	ర	<0.02	පි	<0.02	片	<0.02	Mn	<0.02	Z	<0.02	8	<0.02	ğ	<0.2	Ę	<0.02	χρ	40.02
10'	Ö	<0.02	ජි	40.02	Fe	<0.2	Hg	40.2	Δ,	<0.02	Æ	<0.02	డ	<0.02	Ę	<0.02	¥	<b>Q</b> .02
707	රි	<0.02	පි	₹0.02	2	₹0.02	Wo	<0.02	武	<0.02	Sm	<0.02	Ø	<0.02	Sn	<0.02	2	<0.02
700	ਰੋ	<0.02	Αū	<0.02	£	<0.02	PN	<0.02	×	40.2	S	<0.02	Ta	<0.02	Ξ	<0.02	Z	40.02
	6.00 6.00 6.00 6.00 6.00 6.00		3 5 5 5 5 5	2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Cd	Cd	Cd	Cd	Cd	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02           Ca         T         En         -0.02         Ho         -0.02         Li         -0.02           Ce         -0.02         Eu         -0.02         in         -0.02         Mg         -0.02           Cr         -0.02         Gd         -0.02         Fe         -0.02         Mn         -0.02           Co         -0.02         Ge         -0.02         Fe         -0.02         Mo         -0.02           Cu         -0.02         Au         -0.02         Fe         -0.02         Mo         -0.02	Cd         -60.02         Dy         -60.02         Hf         -60.02         Li         -60.02         Ni           Ca         T         En         -60.02         Ho         -60.02         Lu         -60.02         Nh           Ca         -60.02         Eu         -60.02         In         -60.02         Mn         -60.02         Pd           Cr         -60.02         Ga         -60.02         Fe         -60.2         Hg         -60.2         Pr           Co         -60.02         Ga         -60.02         La         -60.02         Rr         -60.02         Rr           Cu         -60.02         Au         -60.02         Pr         -60.02         Rr	Cd         -6002         Dy         -6002         Hf         -6002         Li         -6002         Ni         -6002           Ca         T         En         -6002         Ho         -6002         Lu         -6002         Nh         -6002           Ca         -6002         Eu         -6002         Ir         -6002         Mn         -6002         Pd         -6002           Cr         -6002         Ga         -6002         Fe         -602         Hg         -6002         Pd         -6002           Co         -6002         Ga         -6002         Fe         -6002         Nd         -6002         Fr         -6002           Cu         -6002         Au         -6002         Nd         -6002         R         -6002         Fr         -6002	Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002         Pr           Ca         T         En         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002         Rh           Ca         -6.002         Eu         -6.002         Ir         -6.002         Mn         -6.002         Rh         -6.002         Rh           Cr         -6.002         Ga         -6.002         Fe         -6.02         Hg         -6.02         Ph         -6.02         Rh           Cr         -6.002         Ga         -6.002         La         -6.02         Rg         -6.02         Rh           Cr         -6.002         Ga         -6.002         No         -6.02         Rg         -6.02         Rg           Cu         -6.002         Au         -6.002         No         -6.02         Rg         -6.02         Sm           Cu         -6.002         Au         -6.002         No         -6.002         Rg         -6.002         Sm           Cu         -6.002         Au         -6.002         No         -6.002         Rg	Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Pr         -d002           Ca         T         Ba         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Rb         -d002           Cc         -d002         Ba         -d002         Ir         -d002         Mn         -d002         Rb         -d002         Rb         -d002           Cr         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Ru         -d002           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Ru         -d002           Cu         -d002         Au         -d002         NG         -d002         Rr         -d002         Sc         -d002	Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Rr         -d002         Si           Ca         T         Ea         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Rr         -d002         Si           Ca         -d002         Ea         -d002         Hr         -d002         Mn         -d002         Rr         -d002         Na           Cr         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Rr         -d002         Na           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr           Cu         -d002         Au         -d002         Nd         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02         Se         -0.02           Ca         T         Eu         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02         Si         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Cr         -0.02         Gd         -0.02         Ir         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Cr         -0.02         Fa         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Cr         -0.02         Fa         -0.02         Rr         -0.02         Sr	Cd         4002         Dy         4002         H         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Th           Ca         T         Ea         4002         Ha         4002         Lu         4002         Nb         4002         Rb         4002         Tr           Ca         4002         Eu         4002         Ha         4002         Pd         4002         Rb         4002         Tr           Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Sr         4002         Tr          Cr         4002         Au         4002         Rr         4002         Rr         4002         Sr         4002         Sr         4002           Cu         4002         Au         4002         Rr         4002         Rr         4002

(T) = Target analyte

### Physical Characterization:

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



Certified by:

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

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

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

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

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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com 031523 031523 Giovanni Esposito Pedro L. Rentas Liovanni Formulated By: Reviewed By: Certified Reference Material CRM Nitric Acid Nitric Acid Solvent: 21110221 Lot # 60.0 (mL) % 5E-05 Balance Uncertainty 0.058 Flask Uncertainty 3000.41 Ambient (20 °C) Calcium (Ca) Weight shown below was diluted to (mL): 031523 031526 10000 **6UTB** Recommended Storage: Nominal Concentration (µg/mL): Part Number: Lot Number: Description: **Expiration Date:** NIST Test Number: CERTIFIED WEIGHT REPORT:

Compound	RM#	Lot Number	Nominal Purity Conc. (µg/mL) (%)	Punty ) (%)	Purity Uncertainty Assay (%) Purity (%) (%)		Target Weight (g)	Actual Weight (g)	Expanded Actual Actual Uncertainty (Sc Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS#	Expanded Uncertainty +/- (ug/mL)	(Solv CAS#	SDS Information (Solvent Safety Info. On Attached pg.)  NS# OSHA PEL (TWA) LD50	Attached pg.) LD50	NIST
1. Calcium carbonate (Ca)	IN014	INO14 caboragezat	10000 99.999	666'66	0.10	38.9	75.1990	75.2093	10001.4	20.0	471-34-1	5 mg/m3	ort-rat	3109a
[1] S <sub>1</sub>	[1] Spectrum No.1		2.2.2.4	8ec]:6	12.514 sec]:58120.D# [Count] [Linear]	<u> </u>	unt) [Line	ger]						
1.0E4														
m/z->	0	.0		0	.0	40000-4	000	0	2	0	0		001	
2. 4 4														
m/z->	0	120		0 0	140		150	180	170	0	180	000		
6.0E4														
m/z->	019	220		230	240		250	260						





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

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

					•	Trace Me	tals	Verificat	<u>io</u>	by ICP-A	MS (	$(ng/m\Gamma)$		r				
	STATE OF THE PARTY OF		District of the	THURST STATE	SICKSIS.	STON SAFETY SAGE	S. Parlie	THE SHARE SHARE	Series .		SEC.		- 1000	THE REAL PROPERTY.	THE PERSON			
707	ප	<0.02	δ'n	<b>40.02</b>	H	<0.02	II.	<0.02	Z	<0.02	F	<0.02	Se	<0.2	13	<0.02	≱	<0.02
707	రో	H	卢	₹0.02	윒	20.02	3	<0.02	ź	<0.02	2	<0.02	ន	<0.02	Je	<0.02	Þ	₹0.02
0.7	ඊ	<b>40.02</b>	뤕	<0.02	Я	<0.02	Mg	40.01	ő	<0.02	쥝	<0.02	Ag	<0.02	F	<0.02	>	<0.02
707	ర	<0.02	පි	<0.02	片	<0.02	Mn	<0.02	Z	<0.02	8	<0.02	ğ	<0.2	Ę	<0.02	χρ	40.02
10'	Ö	<0.02	ජි	40.02	Fe	<0.2	Hg	40.2	Δ,	<0.02	Æ	<0.02	డ	<0.02	Ę	<0.02	¥	<b>Q</b> .02
707	රි	<0.02	පි	₹0.02	2	₹0.02	Wo	<0.02	武	<0.02	Sm	<0.02	Ø	<0.02	Sn	<0.02	2	<0.02
700	♂	<0.02	Αū	<0.02	£	<0.02	PN	<0.02	×	40.2	S	<0.02	Ta	<0.02	Ξ	<0.02	Z	40.02
	6.00 6.00 6.00 6.00 6.00 6.00		3 5 5 5 5 5	2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Cd	Cd	Cd	Cd	Cd	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02           Ca         T         En         -0.02         Ho         -0.02         Li         -0.02           Ce         -0.02         Eu         -0.02         in         -0.02         Mg         -0.02           Cr         -0.02         Gd         -0.02         Fe         -0.02         Mn         -0.02           Co         -0.02         Ge         -0.02         Fe         -0.02         Mo         -0.02           Cu         -0.02         Au         -0.02         Fe         -0.02         Mo         -0.02	Cd         -60.02         Dy         -60.02         Hf         -60.02         Li         -60.02         Ni           Ca         T         En         -60.02         Ho         -60.02         Lu         -60.02         Nh           Ca         -60.02         Eu         -60.02         In         -60.02         Mn         -60.02         Pd           Cr         -60.02         Ga         -60.02         Fe         -60.2         Hg         -60.2         Pr           Co         -60.02         Ga         -60.02         La         -60.02         Rr         -60.02         Rr           Cu         -60.02         Au         -60.02         Pr         -60.02         Rr	Cd         -6002         Dy         -6002         Hf         -6002         Li         -6002         Ni         -6002           Ca         T         En         -6002         Ho         -6002         Lu         -6002         Nh         -6002           Ca         -6002         Eu         -6002         Ir         -6002         Mn         -6002         Pd         -6002           Cr         -6002         Ga         -6002         Fe         -602         Hg         -6002         Pd         -6002           Co         -6002         Ga         -6002         Fe         -6002         Nd         -6002         Fr         -6002           Cu         -6002         Au         -6002         Nd         -6002         R         -6002         Fr         -6002	Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002         Pr           Ca         T         En         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002         Rh           Ca         -6.002         Eu         -6.002         Ir         -6.002         Mn         -6.002         Rh         -6.002         Rh           Cr         -6.002         Ga         -6.002         Fe         -6.02         Hg         -6.02         Ph         -6.02         Rh           Cr         -6.002         Ga         -6.002         La         -6.02         Rg         -6.02         Rh           Cr         -6.002         Ga         -6.002         No         -6.02         Rg         -6.02         Rg           Cu         -6.002         Au         -6.002         No         -6.02         Rg         -6.02         Sm           Cu         -6.002         Au         -6.002         No         -6.002         Rg         -6.002         Sm           Cu         -6.002         Au         -6.002         No         -6.002         Rg	Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Pr         -d002           Ca         T         Ba         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Rb         -d002           Cc         -d002         Ba         -d002         Ir         -d002         Mn         -d002         Rb         -d002         Rb         -d002           Cr         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Ru         -d002           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Ru         -d002           Cu         -d002         Au         -d002         NG         -d002         Rr         -d002         Sc         -d002	Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Rr         -d002         Si           Ca         T         Ea         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Rr         -d002         Si           Ca         -d002         Ea         -d002         Hr         -d002         Mn         -d002         Rr         -d002         Na           Cr         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Rr         -d002         Na           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr           Cu         -d002         Au         -d002         Nd         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02         Se         -0.02           Ca         T         Eu         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02         Si         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Cr         -0.02         Gd         -0.02         Ir         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Cr         -0.02         Fa         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Cr         -0.02         Fa         -0.02         Rr         -0.02         Sr	Cd         4002         Dy         4002         H         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Th           Ca         T         Ea         4002         Ha         4002         Lu         4002         Nb         4002         Rb         4002         Tr           Ca         4002         Eu         4002         Ha         4002         Pd         4002         Rb         4002         Tr           Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Sr         4002         Tr          Cr         4002         Au         4002         Rr         4002         Rr         4002         Sr         4002         Sr         4002           Cu         4002         Au         4002         Rr         4002         Rr         4002

(T) = Target analyte

### Physical Characterization:

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



Certified by:

2 of 2

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

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800-368-1131 www.absolutestandards.com	100	Å		•	Sertified	Refere	Since Mai	Certified Reference Material CRM	1/203 (	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	ANAB ISO 17034 Accredited AR-1539 Certificate Number ttps://Absolutestandards.com	credited Number rds.com
CERTIFIED WEIGHT REPORT:						1	Lot#			る				
Fart Number: Lot Number: Description:		57182 061522 Lead (Pb)			Solv	Solvent: 2	20510011	Nitric Acid		Hieram	ranvie Ed	peate		
Expiration Date:		081525				%	40.0	Nitric Acid		Formulated By:	Giovann	Giovanní Esposito	061522	
Recommended Storage: Nominal Concentration (µg/mL):		Ambient (20 °C) 10000	Ő				(TE)			Ph	May 1	C/S		
NIST Test Number: 6UTB Weight shown below was diluted to (mL):	r: 6U as diluted		2000.02	5E-05 B 0.058 FI	5E-05 Balance Uncertainty 0.058 Flask Uncertainty	inty f				Reviewed By:	Pedro L	Pedro L. Rentas	061522	
Compound	RM#	Lot Number C	Lot Nominal Purity Uncertaint Number Conc. (µg/ml.) (%) Purity (%)	Purity (	Purity Uncertainty Assay (%) Purity (%) (%)	- 1	Target Weight (g)	Expanded Actual Actual Uncertainty Weight (g) Conc. (µg/mL) +/- (µg/mL)	Actual	Expanded Uncertainty (4+-(µg/mL) CAS#	SD: (Solvent Safe S# OSHA	SDS information (Solvent Safety Info. On Attached pg.)  # OSHA PEL (TWA) LDSC	pg.)	NIST

SRM

1. Lead(II) nitrate (Pb)	INO29 PBD122016A1	10000	99.999	0.10	62.5	32.0006	32.0041 10001.1		20.0	10099-74-8	0.05 mg/m3	intryne-rat 83 mo/kg 3128	3128
1.0E7	[1] Spectrum No.1	17.284 sec]:58182.D# [Count] [Linear]	(ac):58	82.D*	Cour	nt] [Line		1				p h	
S.0E8													
m/z->>	0 P	O		.0		0	9	02		08	0	100	
1.0E6													
m/z->	1100	190		04	r P	150	160	170	Ī	180	0.00	000	
5.0ES													
Å	220	230		240		250	260						

Lot # 061522

## 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):

							Trace Me	etals	Verifica	tion	by ICP-	SY	(ma/ml)							
Section 2	THE PERSON NAMED IN		NASSEST DESCRIPTION OF THE PERSON OF T	Name of Street	THE THE THE		SCHOOL STATES	SAME AND PERSONS			-		,				-			7
₹	<0.02	ಶ	<0.02	Δ	<0.02	H	<0.02	Ľ	<0.02	ž	<0.02	ď	L	3	200	É	200		200	911
Sp	<0.02	ථ	<0.2	į.	600	H	200	1	8	4	8	è		3	707	0.7	70'05	*	70.02	_
¥	ç	d	1 6	,		2	7000	3	70.02	ON	70.02	2		3	<b>Q.02</b>	<u>e</u>	\$0.02	Þ	<b>40.02</b>	_
ĉ	7:05	3	Z0:02	弱	80.02	크	900	¥	Ø.01	ő	<b>40.02</b>	Rh		Ao	<b>CO O</b>	E	200	2	5	
Ba	<0.02	ඊ	<0.02	3	<0.02	14	<0.02	M	2000	Pd	200	40		2	9	1	70:02	- [	20.00	-
Be	<0.01	Ċ	<0.02	گ	2000	Ę	200	, in	6		20:00	2 6	20.02	Z (	705	=	Z0:02	X.	<b>₹0.02</b>	_
ä	200	ζ		1	200	2 ,	707	20	707	٠,	70.02	<u> </u>		ž	<0.02	H	<b>40.02</b>	¥	<b>40.02</b>	_
i 6	70.02	3 ,	70:0>	5	20102 	3	Q0:05	OW.	<0.02	<b>Z</b> .	<0.02	SH		S	₹0.02	Sn	<b>40</b> .02	Z	<b>40.02</b>	_
2	20.05	3	<0.02	Αū	<0.02	£	T	ž	<0.02	×	40.2	S		Ţ	<b>€0.02</b>	Ę	200	7.	3	-

Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 061522

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

the preparation of all standards.

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

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

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

<sup>\*</sup> 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

R : 03 | 17 | 12



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Giovanne

Nitric Acid

Solvent: 20510011

#ioj

Nitric Acid

350.0 (m)

7.0%

092122 092122 Giovanni Esposito Pedro L. Rentas Formulated By: Reviewed By:

٠.		
SDS Information	(Solvent Safety Info, On Attached pg.)	L) CAS# OSHA PEL (TWA) LD50
Expanded	Actual Actual Uncertainty	1/- (ug/mL)
	Actual	Conc. (ug/mL)
		_
1	arget	Weight (g)
	Assay	9
1	unity Unkertality Assay	runty (%)
Dringer	runcy (85)	R
Nominal	Conc (un/ml)	COLLEG (ARRYTHL)
ŧ	Number	
	RM#	
	Compound	

5E-05 Balance Uncertainty 0.12 Flask Uncertainty

5000.1

Weight shown below was diluted to (mL):

NIST Test Number:

Ambient (20 °C)

10000 **6UTB** 

092125

Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):

Iron (Fe) 092122

Description: Lot Number:

Part Number:

CERTIFIED WEIGHT REPORT:

31268	orl-rat 7500mg/kg 3126a	5 mg/m3	1453-53-0	Ш										
			20 0 2430.00.0		50.0034 50.0111 10001.5	50.0111	50.0034	100.0	0.10 100.0	99.985	10000	2224912-500	IN346	Iron (Fe)
SKM	LUSU	COLONIE (TWA)												
	0101	Purity (%) (%) Weight (g) Weight (g) Conc. (Loc/ml) +/- (Loc/ml) CAS# OCHA DEI (710A)	CAS#	+/- (ma/ml)	Conc. (ua/mL)	Weight (g)	Weight (g)	(%)	Purity (%)	98	Conc. (µg/mL)	Muraber	White	
NICT	Hached on )	ent Safety Info. On Ar	(Soh	Uncertainty	Actual	Actual	arget	Assay	OINCE CARRIED	Lunch			DALLE	Compound
							A	Annair	Incorporate	Pint	Kumun	ŏ		

(6.1) 10.11	2.0E4	1.0£8	1.0E8	<-Z/W
	octrum No.1	-01	110	c c
IN346 2224912-500	[1] Spectrum No.1 [ 30,763 sec]:58126.D# [Count] [Linear]	20.	120	200
10000	Count] [Linear]	90	130	
99.985				
0.10		- 6	140	
100.0				
50.0034		. 09	150	
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50.0111 10001.5		02	170	
20.0				
7439-89-6		. 0.0	180	
5 mg/m3		06	19.0	
orl-rat 7500mo/km 3128a	S AURILLOOL WILLIAM TO THE STATE OF THE STAT	100	500	

260

### Certified Reference Material CRM





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

							Trace Me	stals	Verificat	ion b	y ICP-MS	gu)	/mL)						
STORY .	000				200		404				NAME OF TAXABLE PARTY.								
æ	40.02	3	70.05	ŝ	70'0>	Ē	70102	3	Z0702	ž	<0.10	£	<b>₹0.02</b>	š	402	e	<b>40.02</b>	*	40.02
S.	<0.02	రే	<b>4</b> 02	山	<0.02	He	<b>40.02</b>	3	<0.02	ź	<0.02	Re	<0.02	ૹ	<b>40.02</b>	<u>6</u>	<0.02	n	<0.02
As	Ø.2	ප	<0.02	큡	<0.02	멸	<0.02	Mg	<0.01	ő	<0.02	꿆	<0.02	Ag	<0.02	F	<0.02	>	<0.02
Ba	<b>40.02</b>	ඊ	Ø.02	3	<0.02	ㅂ	<b>40.02</b>	Ma	<0.10	몺	<0.02	8	<0.02	Š	40.2	Ē	<0.02	χ.	<0.02
Be	<b>₩</b>	ŏ	<b>40.05</b>	පී	<0.02	£	40.2	Hg	40.2	Δ.	<0.02	Ru	<0.02	Ŗ	<0.02	뎚	<0.02	٨	<0.02
Ä	<b>40.02</b>	රි	Ø.10	ප	40.10	ጟ	<b>40.02</b>	Mo	<b>40.02</b>	£	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zu	<0.05
В	<0.02	ರ	<0.10	Απ	<0.02	£	<0.02	R	<0.02	M	<0.2	ß	<0.02	Ta	<0.02	F	<0.02	Z	<0.02

(T)= Target analyte

### Physical Characterization:

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



Certified by:

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

All standard containers are meticulously cleaned prior to use.

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

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

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

2 of 2

### 800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



### Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

Description: Lot Number:

58119 120822 Potassium (K)

Solvent: 20510011 Nitric Acid

Lot #

Javanva

アイクラクスで

60.0 <u>a</u>

2%

Nominal Concentration (µg/mL):

NIST Test Number:

**6UTB** 10000 Ambient (20 °C) 120825

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

3000.4

5E-05 Belance Uncertainty

0.06 Flask Uncertainty

Nitric Acid

Formulated By:

Giovanni Esposito

120822

Reviewed By:

Pedro L. Rentas

120822

12 [1]	Potassium nitrate (K)	Compound
[1] Spectrum No.1 [ 35.763 sec]:58119 D# (Count II Insert	IN034 KD022021A1 10000 99.989 0.10 37.6 79.7990 79.8075	Lot Nominal Purity Uncertainty Assay Target Actual RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) C
35.763 se	10000	Nominal Purity Uncertainty Assay Conc. (µg/ml.) (%) Purity (%) (%)
9C]:58	99.999	Purity (%)
119.0	0.10	Uncertainty Purity (%)
# []	37.6	Assay (%)
inti II ina	79.7990	Target Weight (g)
	79.8075	Actual Weight (g)
	10001.1	Actual Conc. (µg/mL
	10001.1 20.0 7757-79-1	Expanded Uncertainty +/- (µg/mL)
	7757-79-1	(Solv
	5 mg/m3	Expanded SDS Information Actual Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50
	orl-rat 3015 mg/kg 314	n tached pg.) LD50
	kg 3141a	NIST

m/z-y	5000	m/z->	1.0E5	m/z->	1.000	2.016
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Lot # 120822

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(T) = Tar	40.00 40.00 40.00 40.00 40.00 40.00 40.00	Verifica
Target analyte	K P P Z O K N	ation
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	S B B B B B	SW
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	55~\$<□≤	
	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	

### Physical Characterization:

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

Certified by:

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

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

Lot # 120822

### Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



### Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

m/z->	N 5 10	5.0E5	5.0E5	m/z->	5000	1.004
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230		130		۵. ۵.		
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260		160		0		
		170		70		
		380		<b>8</b> 2.		
		0				
		190		90		
		N 0- 0		100		
		Ŏ		0		



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	B	ᄧ	Ве	В	As	Sb	Δ	Monthly		
	A).02	<b>4</b> 0.02	40,01	<b>A</b> .02	<b>40.2</b>	△0.02	△0.02			
	δ	පි	Ω	င္တ	දි	ర్జ	Ω			
	<b>40.02</b>	<b>40.02</b>	<b></b> )	40.02	40.02	40,2	△0.02			
	Æ	ဂ္ဂ	වූ	ନ୍ଧ	멸	녆	Dy	80		
	<b>40.02</b>	40.02	40.02	<0.02	40.02	40.02	40.02	mineral differences		
	3	Ľ	स्र	Ħ	ď	ᅜ	Ж	Sheriff tool		
	<b>40.02</b>	40.02	40.2	A).02	<0.02	40.02	40.02		I race M	1
	폺	Мо	В.	Ķ	ВМ	Ē	П	MISSON ISSUE	Metals	1
3	A0.02	40.02	40.2	40.02	40,01	<b>∆</b> .02	40.02	SI RECEIPTOR	Verification	
Towns and the	~	ን	70	굕	ô	₹	3	SHEWARDS	Clon	-
	<b>∆</b> 0.2	40.02	40.02	40,02	40.02	40.02	40.02	THE PARTY OF THE P	by ICP-M	
	Sc	Sm	잗	공	Rh	æ	Pr		S (Hi	5
	<0.02	<0.02	<0.02	40.02	40,02	40.02	<0.02		g/mL)	
	Ta	S	ñ	Z.	Ą	Si.	Se			
	40.02	<0.02	40.02	402	<b>40.02</b>	40.02	402			
	==	Sn	Tm	Ħ	ᄇ	급	176			
	40,02	40.02	40,02	40,02	<0.02	40,02	<0.02	Company of the Company		
	Zr	Zn	~	뀱	۷	Ϥ	W	可能を発展		
	<0.02	<b>&lt;</b> 0.02	<0.02	<0.02	40.02	<b>△0.02</b>	<0.02	SALES OF SALES		

(I)= larget analyte

### Physical Characterization:

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

Certified by:

\* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
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### Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

M5697 B: 10/27/23

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

CERTIFIED WEIGHT REPORT:	l=						Lot #	Solvent:						L:
Pe	Part Number: Lot Number: Description:	O look life	58029 102523 Copper (Cu)	9			24002546	Nitric Acid				M		
							2.0%	40.0	Nitric Acid	Formulated By:	šy:	Benson Chan	102523	
Exp	Expiration Date:		102526	2				(mL)		,	0	D		
Nominal Concentration (µg/mL):	ion (µg/mL):	<u></u> >	1000	S						M	N	tento		
NIST T	NIST Test Number:	0	втв		5E-05	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	102523	
Volume sh	Volume shown below was diluted to (mL):	diluted	1 to (mL):	2000.02	0.058	Flask Uncertainty	ч							ū
										Expanded		SDS information	tion	
Compound	Z	Part	Lot	Dilution	Initial Vol. (ml.)	Uncertainty Pipette (ml.)	Nominal	Initial	Final	Uncertainty	(Solv	(Solvent Safety Info. On Attached pg.)	Attached pg.)	NIST
					von (mr.)	son (min) s species (min)	Const. (Agy ann)	Course (Jage cont.)	Course (hgy min.)	the Organization	COLON	(1117)	E-30	Civia
Copper(II) nitrate trihydrate (Cu)		58129	100223	0.1000	200.0	0.084	1000	10000.1	1000.0	20	10031-43-3	1 mg/m3	ori-rat 794 mg/kg	3114
1.0E6	[1] Spectrum No.1	Z	_	3.422 s	əc]:58	)29.D# [C	33.422 sec]:58029.D# [Count] [Linear]	near]	en.					
									The Park of the Art of					
5.OE5									nerhetileren hete ekstervicht vickspilvingsk					
m/z->	10		N O	30	12 12	4	50		7		B)	90	0	
5.0E7														
2.567														
m/z->	110		120	130		140	150	160	170		180	190	200	
2.067														
1.027														
m/z->	210		220	230		240	250	260						

www.absolutestandards.com

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

		_				_	_	Comments.	-
	Ľ	<u>в</u>	Ве	Ва	As	Sb	Δ		
	20.02	8.00	10.0	40.02	402	40.02	40.02		
	2	, ზ	υ	င္ပ	ပ္ပ	δ	8		
	-	<b>&lt;0.02</b>	<b>40.02</b>	<0.02	<0.02	40.2	<0.02		
	Au	Š.	Ç	£	멸	य	Dy		
	<0.02	40,02	<0.02	<0.02	<0.02	40.02	40.02		
	3	F	팖	=	Ы	Но	Ħ		
	40.02	<b>40.02</b>	40.2	△0.02	<0.02	<0.02	40.02		Trace M
	Nd	Мо	Hg	M	Mgg	Lu	<u>E</u>		letals
(T) = Target analyte	A0,02	<0.02	40.2	40.02	10.05	40.02	40.02		Verifica
et anal	×	7	ק	Ъ	တ္တ	3	Z		<del>-</del>
vie	40.2	40.02	40.02	40.02	40.02	<0.02	<0.02	27 101	-4-10-14 
	&	Sm	Ru	짱	Rh	Re	Pr	G	
	40.02	<0.02	40.02	A).02	40.02	<b>6</b> 0.02	40.02	g/ 1111L/	
	Ta	Ø	Sr	Z	Ag	S:	Š		
	40,02	<0.02	40.02	40.2	40.02	<b>40.02</b>	40.2		
	77	Sn	F	Ħ	::	Te	급		
	40.02	40.02	40.02	40.02	40.02	<0.02	40.02		
	Zr	25	ĸ	<b>¥</b>	<	ď	W		
	<0.02	40.02	<b>40.02</b>	40.02	40.02	<b>∆</b> 0.02	<b>₹0.02</b>		

### 1.1

### Physical Characterization:

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

### Certifled 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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  \* 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).

ırt # 58029

2 of 2

### Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



### Certified Reference Material CRM

M5648 8: 10/23/23

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

CERTIFIED WEIGHT REPORT: 1. Manganese(II) nitrate tetrahydrate (Mn) Compound Nominal Concentration (µg/mL): m/z-> m/z-> M/Z-V 5.OE7 1.0≣8 5.0厘7 1,0E8 2.5E6 5.0E6 Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: [1] Spectrum No.1 Lot Number: Description: 110 210 0 58125 Number Part 58025 102623 **BTUB** 1000 Ambient (20 °C) 102626 Manganese (Mn) 071123 120 Number 20 Ĕ [ 34.243 sec]:57025.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 30 Vol. (mL) Pipette (mL) Conc. (µg/mL) 300.0 0.058 5E-05 Initial Flask Uncertainty Balance Uncertainty 240 140 Uncertainty 40 0.084 24002546 Nominal 2.0% Lot # 1000 250 150 0 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid Solvent: 10000.1 Initial <u>a</u> 60.0 260 160 00 Nitric Acid 1000.0 Final 170 0 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Expanded <u>2</u> 180 80 20694-39-7 CAS# (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) 90 Pedro L. Rentas Benson Chan SDS Information 5 mg/m3 200 100 ort-rat >300mg/kg D50 102623 102623 3132 SRM

Printed: 10/26/2023, 1:20:32 PM



		-	_		_	_		
	B	Bi	Be	Ва	As	Sb	Δ	
	40.02	0.02	40.01	<0.02	40.2	40.02	<b>4</b> 0.02	
	δ	င္ပ	δ	ဂ္ဂ	ဂ္ဂ	ប្	δ	
	<b>40.02</b>	<0.02	<0.02	<0.02	<0.02	40.2	40.02	
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	PB	7	æ	. <b>타</b>	Ħ	Но	Ħ	
	40.02	40.02	40.2	40.02	A0.02	A0.02	40.02	Trace M
	M	Mo	Ж	M	Mg	Ę	Ľ	letals
Tamet analyte	40,02	<b>6.02</b>	40.2	H	40.01	40.02	<0.02	Verifica
or or or	×	7	ֿס	Pd	õ	3	Z	tion
1	40.2	40.02	<0.02	<0.02	40.02	<0.02	<0.02	by ICP-N
	Sc	Sm	Ru	<b>R</b>	공	<b>₽</b>	27	S (µ
	<0.02	<b>&lt;0</b> .02	<0.02	<0.02	<0.02	<0.02	<0.02	g/mL)
	Ta	S	Sr	Z,	Ag	Si	જ	
	40.02	<b>∆</b> .02	<0.02	02	40.02	A.02	40.2	
	11	S	Tin	Ħ	∄	귾	41	
	40.02	<0.02	<0.02	40.02	40.02	40.02	40.02	
	Zr	Zn	۲	\$	<	<b>-</b>	¥	
	40.02	A 0.02	40.02	△0.02	∆0.02	40.02	<0.02	

(I) = larget analyte

### Physical Characterization:

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

Certified by:

<sup>\*</sup> The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated

<sup>\*</sup> Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the balances that are calibrated with weights traceable to NIST (see above).

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

<sup>\*</sup> 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).

www.absolutestandards.com



## M5768 [M576] (B) R:1/3/24 Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: Magnesium nitrate hexahydrate (Mg) IN030 маровгозат Compound Nominal Concentration (µg/mL): m/z-> M/2-> m/z-> Weight shown below was diluted to (mL): Recommended Storage: 2.0≡4 1.0E4 5.0E5 1.0E6 1000 2000 NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 쭕 **BTUB** 58112 091823 10000 Ambient (20°C) (M5+18), (M5+16) 091826 Magnesium (Mg) Number 120 ğ 20 [ 19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.02 0.058 Flask Uncertainty 10000 Nominal 130 230 30 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) (%) 140 0.10 240 40 Solvent: 24002546 Nitric Acid 8.51 150 234.9118 Weight (g) Target Lot # Ē Weight (g) Conc. (µg/mL) 234.9126 Nitric Acid Actual 160 260 0 10000.0 Actual 170 6 +/- (µg/mL) Expanded Uncertainty Reviewed By: Formulated By: 20.0 180 80 13446-18-9 (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 Pedro L. Rentas Lawrence Barry 190 **SDS Information** Ö Z 200 100 orl-rat 5440 mg/kg 3131a 091823 091823 SRM



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

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

	555	В	Ве	Ва	As	Sb	A		
						_			
	∆0.02	0.02	40.01	<0.02	<b>60.2</b>	<0.02	<0.02		
	Ĉ.	ဝ	Ω	Ŝ	ද	ದ್	Ω		
	<b>∆</b> 0.02	<0.02	<0.02	<0.02	40.02	40.2	<0.02		
	Αu	ရွာ	က္အ	8	탇	耳	Dy		
	<b>₹0,02</b>	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
	73	L <sub>a</sub>	Fe	F	In I	Ho	Hf		ı
	<0.02	40,02	40.2	<0.02	<0.02	<0.02	<0.02	I acc	-1
	Z.	Mo	Hg	Mn	Mg	ŗ	5	Mergis	2
)	<0.02	<0.02	<0.2	<0.02	<b>⊷</b> ]	<0.02	<0.02	Verifica	No.
	×	7.	Р	Pd	S <sub>O</sub>	Ş	Z.		
	40.2	40.02	40.02	<0.02	<0.02	40.02	<0.02	יטע וכד-ו	3
	Sc	Sm	Ru	Rb	Rh	Re	Pr	AU (F	
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	Ta	CO.	Sr	Na	δķ	Σ:	Se		١
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	Ti	Sn	Im	Th	∄	Te	-Tι		
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(1) = larget analyte

### Physical Characterization:

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

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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).

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

24002546 Nitric Acid

2.0% 

Nominal Concentration (µg/mL):

NIST Test Number:

BTU<sub>9</sub> 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

**Expiration Date:** 

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

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





800-368-1131



## Certified Reference Material CRM

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

							Trace M	etals	Verificat	cation	by ICP-M	(J) S	ua/mL)						
	TATES AND AND		District Color	STATE OF THE PERSON		Senter and		SOMETHINGS.	NAME OF STREET	SAMOOGE STATE	SECOND SPINSO	None and a	. 18						
F	<0.02	3	<0.02	Ďλ	<0.02	HL	<0.02	Li	<0.02	z	<0.02	Ā	<0.02	Se	<0.2	T.	<0.02	M	<0.02
Sp	<0.02	ථ	<b>40.2</b>	占	₹0.02	He	<0.02	3	<0.02	£	<0.02	Re	<0.02	Š	<0.02	ę	₹0.02	Þ	<0.02
As	<0.7	ඊ	<0.02	립	<b>₩</b>	ដ	<b>€0.02</b>	Mg	10.0>	ő	<0.02	Rh	<0.02	Ag	<0.02	F	<0.02	>	<b>40.02</b>
Ba	<0.02	ర	<0.02	3	<0.02	ㅂ	<0.02	Mn	<0.02	2	<0.02	8	<0.02	ž	40.2	Ħ	<0.02	2	<0.02
æ	Т	Ç	<b>40.02</b>	ő	<b>40.02</b>	£	<0.7	Hg	<02	Δ,	<0.02	Ru	<0.02	š	<0.02	Tm	₹0.02	×	<b>40.02</b>
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æ	<0.02	ರೆ	<0.02	Au	<0.02	£	₹0.02	PK	<0.02	M	<0.2	S	<b>40.02</b>	Ta	<0.02	F	<0.02	Z	<b>40.02</b>

(T) = Target analyte

### Physical Characterization:

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

### Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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

<sup>\*</sup> 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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122



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## CERTIFIED WEIGHT REPORT:

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

Salvents: 21110221

Nitric Acid Hydrochloric acid

Lot #

22D0562008

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

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

RM#

Number

Conc. (µg/mL) Nominal

(%)

Uncertainty Assay
Purity (%) (%)

Weight (g)

Target

ρţ

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> 10.0 30.0

3 6%

Nitric Acid

Formulated By:

Benson Chan

071123

Hydrochloric acid

Reviewed By:

Pedro L. Rentas

071123

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

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



### 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) = larget analyte

### Physical Characterization:

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

Certified by:

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Certified Reference Material CRM

R: 02109124





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

						TANK BURNE	10000	CHICAGO CONTROL CONTRO	URCH LABILLY	ianioc)	(Solvent Safety Into, On Attached pg.)	rttached pg.)	202
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL) C	conc. (ug/ml.)	Conc. (µg/mL)	Conc. (ug/ml.)	+/- (ng/mL)	CAS#	Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)	1050	SRM
Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0	58127	050923	0.1000		0.084	1000	10000	100001 100001	9.0	10008.000	000	700	- 5
							20000		7:5	100c0-22-9	O.UZ ING/ITIS	STEE 10020-22-9 0.02 mg/ms on-rat 691 mg/kg 3113	3113
2000	之 ヒコギ	1.0	9 4 DAG 46	Cau. Co	CHARLE WO	[1] Specifical No.1 Cat. 04.04% pool: nacotation of the partition of the p							

1.0E6	5.0E5	m/z->	5.0E7	1.0E8	5.0E7
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		.09		150	
		. <b>O</b>		160	
				170	
		02			
		80		160	
		00		180	
		100		200	

Lot # 091923

250

240

230

220

010

W/Z->

## Certified Reference Material CRM





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

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

							Trace M	etals	Verifical	tion	by ICP-M	4S (F	ig/mL)						
1							STREET, STREET	No section lives	ALL DESCRIPTION OF THE PERSON	10.000	Market Mark	MINNSH.	Sandara American	NAME OF TAXABLE PARTY.	Service of the last	SECOND STATES		THE REAL PROPERTY.	STREET, SQUARE,
IV	<0.02	ಶ	1	Š	40.02 Dy 40.02	Ħ	<0.02	П	<0.02	Z	<0.02	Æ	<0.02	B	<0.2	£	<0.02	A	<0.02
ౙ	<b>40.02</b>	రే	<b>40</b> 7	占	<0.02	H9	<0.02	.3	₹005	Ź	₹0.02	2	<0.02	Š	40.02	T <sub>e</sub>	40.05	ם	40.02
As	<b>Q</b> 5	ප	40.02	呂	<b>40.02</b>	ų	<0.02	Mg	10.05	ඊ	₹0.02	뙲	<0.02	Ag	<b>40.02</b>	F	<0.02	>	Ø.02
쯃	<b>40.02</b>	చ	<b>40.02</b>	3	<b>4002</b>	ㅂ	<0.02	Ma	<0.02	콘	₹000	2	<b>40.02</b>	N <sub>a</sub>	40.2	Ę	20:0>	Ŗ	Ø.02
2	¥0.01	ඊ	<b>20.02</b>	త్ర	<b>40.02</b>	હ	40.2	쁀	\$ 20	م	₹0.02	콥	40.02	Şt	<b>40.02</b>	Tm	Ø.02	7	Ø.02
遥	<b>40.02</b>	රි	۳	Ğ,	<b>4002</b>	ដ	<0.02	Mo	<b>40.02</b>	Æ	<b>20'0</b> >	S	<0.02	S	<b>40.02</b>	Sn	40.02	Zn	Ø.02
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(T)= Target analyte

### Physical Characterization:

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



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Lot # 091923

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### 02/00/24 Certified Reference Material CRM

W 580



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

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

1. Arsenic (As)

58133

020522

0.1000

400.0

0.084

1000

10001.0

1000.0

2.0

7440-38-2

0.5 mg/m3

orl-rat 500 mg/kg 3103a

Number Part

Number Lot

Vol. (mL)

Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/ml.) Uncertainty Expanded

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

LD50

NIST SRM

SDS Information

111323

111323

Dilution Factor

initial

Uncertainty

Nominal

Initial

Final

Compound

Volume shown below was diluted to (mL):

4000.0

0.06

Flask Uncertainty

-z/x->	500	m/z->	N IN IN	m/z-> 5.0≣4	1.0厘5	2.0E5
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Ŋ		110		ō		[] Speatrum No.1
						Z 0.1
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		A second		er West A best		90]:570
240		140		ò		33.D#
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		180		80		
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Certified by:



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Certified Reference Material CRM

R102109124

MURIC

Solvent: 21110221

Nitric Acid

Lot #

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

CERTIFIED WEIGHT REPORT:

Part Number: **Lot Number:** 

57115 041723

Description:

Phosphorous (P)

**Expiration Date:** 

041726

Nominal Concentration (µg/mL): Recommended Storage: NIST Test Number: 10000 Ambient (20 °C)

**BTUB** 

5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 2000.02

Number 5 Conc. (µg/mL) Nominal 0.058 Flask Uncertainty Purity 3 Uncertainty Assay Purity (%) E Target

1. Ammonium dihydrogen phosphate (P)

IN008 PV082019A1

10000

99,999

0.10

27.5

RM#

Compound

22%

40.0

Nitric Acid

Formulated By:

Lawrence Barry

041723

into

Reviewed By:

Pedro L. Rentas

Expanded SDS Information 041723

Weight (g) 72.7287 Weight (g) Conc. (ug/mL) 72.7289 Actual 10000.0 Actual +/- (µg/mL) Uncertainty 20.0 7722-76-1 CAS# (Solvent Safety Info. On Attached pg.)

# OSHA PEL (TWA) LD50 5 mg/m3 orl-rat >2000mg/kg 3186 NIST SRM

Part # 57115

1 of 2

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(I)= larget analyte

### Physical Characterization:

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

Certified by:

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2 of 2

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Certified Reference Material CRM

109/24

M5817

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 071123 57116

Solvent:

071123

**ASTM Type 1 Water** 

Burense

Formulated By:

Lawrence Barry

071123

Lot #

**Expiration Date:** Description: 071126 Sulfur (S)

Nominal Concentration (µg/mL): NIST Test Number: 10000 Ambient (20 °C)

Recommended Storage:

EU1B

Weight shown below was diluted to (mL): 1999.48 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas SDS Information

 Ammonium sulfate (S) IN117 SLBR7225V 10000 99.9 0.10 24.3 82.4675 82,4682 10000.1 20.0 7783-20-2 Z orl-rat 4250mg/kg 3181

Number Ĕ Conc. (µg/mL) Purity 8 Uncertainty Assay Purity (%) 8 Weight (g) Target Weight (g) Conc. (µg/mL) Actual Actual +/- (µg/mL) OSHA PEL (TWA)

Expanded

071123

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

m/z->	1.005	m/z-> 2.0E5	2.5E5	5.0E5	1000	2000
0		110		0		
N N O		120		20		
230		130		<b>3</b> 0		
24		140		40		
250		150		50		
260		190		8		
		170		70		
		180		8.		
		190		90		
		200		100		

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	40,02 40,02 40,02 40,02 40,02 40,02
	Li Li Mg Mn Hg
(T)= Tarnet analyte	Verifica
dene t	K P P B S S N
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Physical Characterization:

(1)= larger analyte

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

Certified by:

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

### Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

109124 M.5818

Solvent: 24002546 Nitric Acid

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

CERTIFIED WEIGHT REPORT:

Part Number:

Lot Number: Description: 57014 122023

Silicon (SI)

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

**Expiration Date:** 

122026

2%

40.0 (mL)

Nitric Acid

Formulated By:

Aleah O'Brady

122023

122023

Areah o Brasky

Compound			Weight shown below was diluted to (mL): 1999.48 0.058 Flask Uncertainty	NIST Test Number	The second secon
RM#			elow was diluted	Number:	
Number	Lot		d to (mL):	8TUB	
Conc. (µg/mL)	Nominal		1999.48		
(%)	Purity		0.058	5E-05	
Purity (%)	Nominal Purity Uncertainty Assay		Flask Uncerta	5E-05 Balance Uncertainty	
8	Assay		unty	artainty	
Weight (g)	Target				
Weight (g)	Actual				
Conc. (ug/mL)	Actual				
+/- (ug/mL)	Uncertainty	Expanded		Reviewed By:	/
CAS#	(Solve				
OSHA PEL (TWA)	Lot Nominal Purity Uncertainty Assay Target Actual Actual Uncertainty (Solvent Safety Info. On Attac	SDS Information		Pedro L. Rentas	1

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200		NUMP NUMBER Conc. (143/ml.) (%) Purity (%) (%) Weight (a) Weight (b) Conc (143/ml.) CAS# OCUA DCI (74/ml.)	HOAOH	+1/1 (12/11)	Come (sector)	Weight (a)	Weight (a)	8	8) All a	98	Conc. (Ja/mL)	KM# Number	ALI PARTICION DE LA CONTROL DE
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*	orl-mus 70 mg/kg	2.5 mg/m3	2.0 16919-19-0	2.0	1000.0	13.8855	13.8854	14.4	0.10	99.999	1000	IN009 SID082022A1	Ammonium hexafluorosilicate (Si) IN009 sido82022A1 1000 99.999 0.10 14.4 13.8854 13.8855 1000.0
	Esc		CAS#	(ASA) +/- (ASA)	רטות. (ששיוור)	(A) THENDAM	(B) Millione	(101)	fact frience	(00)	400	(A) mediu (A) must (w) (w) (w) mediu (A) mediu (A) conc.	

92 II	CAS#		CAS# OSHA PEL (TWA) LD50 SRM  1919-19-0 2.5 mg/m3 orl-mus 70 mg/kg NA	1. Ammonium hexafluorosilicate (Si) IN009 siposzozza1 1000 98.899 0.10 14.4 13.8854 13.8855 1000.0 2.0 169	Compound  RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL)
		Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)  1000.0 2.0 16919-19-0 2.5 mg/m3	Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)  1000.0 2.0 18919-19-0 2.5 mg/m3	10 14.4 13.8	(%) (%) Weigh
Conc. (µg/mL) +/- (µg/mL) 1000.0 2.0 10	Conc. (µg/mL) +/- (µg/mL) CAS#  1000.0 2.0 16919-19-0			3854 13.8855	ht (g) Weight (g)
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Part # 57014

1 of 2



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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

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

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



Certified Reference Material CRM

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ング

Solvent: 24002546

Nitric Acid

F Lot #

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: 58030

Description:

111623 Zinc (Zn)

Ambient (20 °C) 111626

**Expiration Date:** 

Nominal Concentration (µg/mL): Recommended Storage:

**NIST Test Number:** 

**BTU9** 1000

5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Weight shown below was diluted to (mL):

3000.4

5

Nominal

Purity

Uncertainty Assay

Target

Actual

Actual

Uncertainty

Expanded

<u>%</u> 60.0 <u>a</u>

Nitric Acid

Formulated By: Benson Chan

111623

Reviewed By: Pedro L. Rentas

111623

Zinc nitrate hexahydrate (Zn) Compound [1] Spectrum No.1 [ 31.103 sec]:58130.D# [Count] [Linear] IN016 ZNE032021A1 RM# Number Conc. (µg/ml.) 1 000 99.999 8 Purity (%) 0.10 24.3 3 Weight (g) 12.3475 Weight (g) Conc. (µg/ml.) 12.3502 1000.2 +/- (µg/mL) 2.0 10196-18-6 CAS# OSHA PEL (TWA) orl-rat 1190mg/kg 3168



(Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 **SDS** Information SRM SRM

200

100

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(I) = larget analyte

### Physical Characterization:

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

Certified by:

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



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

These instructions are for advisory purposes only. If any apparent conflict exists between these 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 Metals in Dilute Acidic or Cyanide in Basic Aqueous Solutions HAZARDOUS MATERIAL

> Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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

ICV1-1014

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

Page 1 of 2









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

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

ICV1-1014

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

ICV5-0415

For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and 5% (v/v) nitric acid.

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K₃Fe(CN)₅, 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)
Al	2500	(after 50-fold dilution
Sb	1000	500
As	1000	200
Ba	520	200
Be	510	100
Cd	510	100
Ca	10000	100
Cr	520	2000
Co		100
Cu	520	100
Fe	510	100
Pb	10000	2000
Mg	1000	200
Mn	6000	1200
Ni	520	100
K	530	110
Se	9900	2000
Ag	1000	200
Na	250	50
TI	10000	2000
V	1000	210
Zn	500	100
	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



Certified Reference Material CRM

Lot #

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

 Nickel(II) nitrate hexahydrate (Ni) Nominal Concentration (µg/mL): m/z-> Weight shown below was diluted to (mL): Recommended Storage: NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 210 110 0 N033 NIM052023A1 RM# 6UTB 57028 041124 1000 Ambient (20 °C) 041127 Nickel (Ni) Number <u>6</u> 220 20 [ 12.374 sec]:58128.D# [Count] [Linear] Conc. (µg/mL) Nominal 249.85 100 230 130 30 0.002 Flask Uncertainty 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) 0.10 240 140 40 **Solvent:** 24002546 8 2% 250 150 Weight (g) 50 1.2369 Target 1 5.0 Nitric Acid Nitric Acid Weight (g) 1.2369 Actual 260 160 60 Conc. (µg/mL) 1000.0 Actual 170 0 Reviewed By: +/- (µg/mL) Formulated By: Uncertainty Expanded 2.0 180 80 13478-00-7 CAS# (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Brian Geddes 190 90 OSHA PEL (TWA) SDS Information 1 mg/m3 200 100 orl-rat 1620 mg/kg 041124 041124 3136 NIST SRM

							Ггасе Ме	tals	Verifica	tion	by ICP-I	SN (	μg/mL)						
≥	<0.02	ß	<0.02	Dy	<0.02	HH.	<0.02	L	<0.02	Z.	T	P	<0.02	Se	<0.2	4L	<0.02	₩	40,02
Sb	<0.02	Ç	<0.2	펅	<0.02	Ж	<0.02	Ē	<0.02	\$	<0.02	Re	<0.02	S:	<0.02	T <sub>e</sub>	<0.02	Ϥ	40.02
As	402	င္ပ	<0.02	Eu	<0.02	Б	<0.02	Mg	<0.01	ွှ	<0.02	Rh	<0.02	Ag	<0.02	∄	<0.02	<	40,02
Ba	<0.02	ß	<0.02	වු	<0.02	F.	<0.02	Mn	<0.02	Pd	<0.02	RЪ	<0.02	Z <sub>a</sub>	40.2	Ħ	<0.02	7	40.02
Ве	<0.01	ਨ	<0.02	Ga	<0.02	Fe	<0.2	Hg	40.2	Ā	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	¥	40.02
Bi	<0.02	င္ပ	<0.02	ଦ୍ଧ	<0.02	La	<0.02	Мо	<0.02	¥	<0.02	Sm	40.02	S	<0.02	Sn	<0.02	Zn	40.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	M	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	7	<0.02	Zr	<0.02
									(T) - Towart analysis		that								

= larget analyte

### Physical Characterization:

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

Certified by:

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

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### Certified Reference Material CRM

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m/z->		io io	m/z->	-	Ņ	m/z->	i i	1. Selenium (Se)	Compound		<		Nominal Co	Re			CERTIFIED WEIGHT HEPOHT	מדודודה שובום
210	1.OE8	2.008	110	1.OE8		10	[1] Spectrum No.1				Volume shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Recommended Storage:	1	Lot Number: Description:	Part Number:	1 11000H
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220			120			20	-	071223	Number	Lot	d to (mL):	6UTB	1000	Ambient (20 °C)		060624 Selenium (Se)	57034	
Ŋ			<u></u>			ω	3.702	0.1000	Factor	Dilution	2000.07			<u>ග</u>		Se)		
230			130			30	sec]:58	200.0	Vol. (mL	Initial	0.100	5E-05						
240			140			40	33.702 sec]:58034.D# [Count] [Linear]	0.084	Val. (mL) Pipette (mL) Conc. (μg/mL)	Uncertainty	Flask Uncertainty	Balance Uncertainty						
250			150			50	Count) [L	1000	Conc. (µg/mL)	Nominal	ťγ	ainty			2.0%	24007540	24002546	
260			160			. 60	inearj	10002.5	Conc. (µg/mL	Initial				(m_C)	40.0	Na Contraction	Solvent:	
0						12 33 34		1000.0	Conc. (µg/mL) Conc. (µg/mL)	Final					Nitric Acid			(1)
			170			70		2.2	.) +/- (µg/mL)	Uncertainty	Expanded	Reviewed By:	ta	N	Formulated By:	M		10
			180			80		7782-49-2	C	(So		y:	de	11	By:			
			190			90		2 0.2 mg/m3	OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)	SDS Information	Pedro L. Rentas	leenes		Benson Chan	M		
			2200			100			VA)	). On Atta	rmation	ntas	,	/	ב	5		
						-		orl-rat 6700 mg/kg	1.050	ched pg.)		060624			060624			
								3149	SRM	NIST		ٿ			1+2			

							I race M	1etals	Verifica	lion	oy ICP-M	S (1)	g/mL)						
Al	40.02	CG	<0.02	Dγ	<0.02	HH	<0.02	11	<0.02	Z.	<0.02	Pr	<0.02	Se	H	16	40.02	W	40,02
SЪ	<0.02	ದ್ದ	<0.2	퍜	<0.02	田	<0.02	Į	<0.02	₽	<0.02	Re	<0.02	S:	<0.02	Te	<0.02	U	<0.02
As	<0.2	ಕಿ	<0.02	핃	<0.02	Ы	<0.02	Mg	<0.01	°	<0.02	Rh	40.02	Ag	<0.02	∄	40.02	۷	<0.02
Ва	<0.02	င္တ	<0.02	æ	<0.02	H.	<0.02	Mn	<0.02	Pd	40.02	₽.	<0.02	Na	<0.2	Ħ	<0.02	4	<0.02
Ве	40.01	ť	40.02	Ga	<0.02	Fe	<0.2	Hg	A02	P	<0.02	Ru	40.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	40.02	င္ပ	<0.02	ଦୁ	<0.02	Ľ	<0.02	Mo	<0.02	7	<0.02	Sm	40.02	S	<0.02	Sn	40.02	Zn	<0.02
В	<0.02	Cι	<0.02	Au	<0.02	Pb	<0.02	M	<0.02	×	40.2	Sc	<0.02	Ta	<0.02	Ħ	<0.02	Zr	<0.02

(T) = Target analyte

### Physical Characterization:

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

Certified by:

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

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

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

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

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





M5963 M5964 M5965 M5966 M5967 M5968

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

Revision No.: 0

### Certificate of Analysis

Test	Specification	Result
Assay (HNO3)	69.0 - 70.0 %	69.6 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< I ppm
Chloride (CI)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (AI)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities ~ Calcium (Ca)	≤ 50.0 ppb	< 0.2 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities – Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>





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

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities – Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 µm and greater	≤ 60 par/ml	3 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	1 par/ml

Nitric Acid 69% **CMOS** 





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

**Test** 

Specification

Result

For Microelectronic Use

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



Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

### Certificate of Analysis M5976, M5977 R : 02/22/24 P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

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-MO720876

Matrix:

**H2O** 

tr. NH40H

Value / Analyte(s):

1 000 µg/mL ea:

Molybdenum

Starting Material:

Ammonium Molybdate

Starting Material Lot#:

2361

Starting Material Purity: 99.9893%

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

**Certified Value:** 

 $998 \pm 7 \, \mu g/mL$ 

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

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

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

X<sub>i</sub> = mean of Assay Method : with standard uncertainty uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

u<sub>(s</sub> = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mean of individual results;

X<sub>CRM/RM</sub> = (X<sub>a</sub>) (u<sub>char a</sub>)

X<sub>a</sub> = mean of Assay Method A with

ucher a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots 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 HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-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% NH40H in a LDPE container.

Mo Containing Samples (Preparation and Solution) -Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or 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 95 amu	3 ppt	n/a	40Ar39K16O,79Br1
			6O,190Os2+,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 CRMRM 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

Meyer Trusing

### **Certificate Approved By:**

Michael Booth Director, Technical Michael 2 Booth

### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director Paul R Saine

### Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

info@inorganicventures.com P: 800-669-6799/540-585-3030 P: 540-585-3030 R:2/22/24

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



### ACCREDITATION / REGISTRATION

Number QSR-1034). 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 (GSR Certificate INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for

### PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

2% (v/v) HNO3 :xintsM T2-TI719972 Lot Number:

muineill 1 000 hg/mL ea: Value / Analyte(s): tr. HF

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

1002 ± 5 µg/mL Certified Value: CERTIFIED VALUES AND UNCERTAINTIES

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

Assay Information:

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

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  $\frac{1}{1000}$ 

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mosn of individual results:

 $(x_0) \ (x_0) \ (x_0$ 

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

Characterization of CRM/RM by One Method Characterization of CRM/RM by Two or More Methods

4.0 TRACEABILITY TO NIST

- 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

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

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 III bA-Bitter of ore each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of the properties of the properties

e2 M 078220.0 > gN O 882000.0 > u3 M 863000.0 > gA M

### ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to

Page 2 of 4

INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

> uA M 882000.0

> 9A M 886 0.000.0

> bq M 882000.0 > rq M 888200.0 > rq M 682000.0 > dg M 271100.0

> q O f81200.0 > dq M f82800.0

> iN O 882000.0 > aO M 841200.0

> dN O 322500.0 > N M 862000.0

M - Checked by ICP-MS

Mn < Mg < Li <

> 0H

> 6H

ΉŁ

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

M 976800.0 > 8 | 34500.0 M 576800.0 > 8 M 782600.0

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

> mT M 882000.0 > U M 882000.0 > V M 682000.0 W M

> 6T M 882000.0 > AT M 882000.0

sT M 034450.0 > dT M E70100.0

s 853000.0 M 882000.0

O 69Z000'0

O.043560 O

n2 M 068010.0 89Z000.0 > mS M 89Z000.0

> II

JS

674000.0 228610.0

892000.0 892000.0

0.000268

699630.0

0.001341

892000.0

0.010560

960000'0

960000.0

73260.0 > nZ O 402100.0 038540.0 > nZ O 267400.0

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

7.7 Storage and Handling Recommendations

oM M 882000.0

0.000268 M K 0.000268 M K 0.000268 M K

0.000872 O Fe > 0.008586 M Ga <

O 892000.0

O S37000.0 M 882000.0

M 882000.0

M 603100.0

M 885800.0

M £83200.0 > 00 M GG8020 O.004577 M Gd <

INTENDED USE

W Et < O Cn <

O B <

IA O

### 4.1 Thermometer Calibration

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

### Page 3 of 4

- Chemical Testing - Accredited / AZLA Certificate Number 863.01

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

- QSR Certificate Number QSR-1034

1.01 ISO 9001 Qualify Management System Registration

### MOITATY STANDARD DOCUMENTATION 0.01

Homogeneity data indicate that the end user should take a minimum ample size of 0.0.2 m L to assume

This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. The Coth series alongs mirror and the series of the Coth series alongs mirror and the series of the Coth series alongs mirror and the series of the Coth series alongs mirror and the series of the Coth series alongs mirror and the series of the coth series alongs and the series of the coth series along the series of the coth series along the series of the coth series of t

### HOMOGENEITY

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

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

Ollinger		C INTOTINATION (ICP_OEC n.	Idoseones	
ss radial/axial view):	are given	Estimated D.L. Estimated D.L.	Technique/Line	
Interferences (Underline 11 )	Order	idq 41	ICP-MS 48 amu	
Interferences (underlined indicates severe) 32S16O, 32S14N,	A/N	add		
14N160180,				
14N17N2, 36Ar12C,				
48Ca, [96X=2				
7-Vool (no o				
(where X = Zr, Mo, Ru)]		10000 () 1900 ()	ICP-OES 323.452 nm	
Ce, Ar, Ni		Jm/gu Se000.0 \ +200.0	ICP-0ES 334.941 nm	
		m/pu 820000.0 \ 8500.0	ICP-0ES 336.121 nm	
ла, Та, Сг, U М М9 Ω-	1 1		Mote: This start and F	II-
W, Mo, Co		In/gy 4500000 \ cocos-	nous prepries entre shou	•

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/a

1:1:1 H2O / HF./ H2SO4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite Volentily), Oxide - Northere are repetation; and sociation; restore (Dissolved by heating in 1737 HZO / HF / HZSO4); Oxide - Northere history (~800EC) brooklie (fuse in Pt0 with KZSZO7); Ores (fuse in Pt0 with KZZZO7); Ores (fuse in Pt0 with provide it as plastic pigment and likely in brooktie (fuse in Pt0 with provide it as plastic pigment and likely in brooktie TI Containing Samples (Preparation and Solution) - Metal (Soluble in H2O / HF caution -powder reacts

HNO3 / LDPE container. 1-10,000 ppm single element solutions as the Ti(F)6-2 chemically stable for years in 2-5% HNO3 / trace HF in an LDPE container. with a fendency to hydrolyze forming the hydrated oxide in all dilute acids except HE.

Stability - 2-100 ppb levels stable (Alone or mixed with all other metals) as the Ti(F)6-2 for months in 1%

HNO3 / LDPE container. 1-10.000 ppm sincle element solutions as the Ti(F)8-2 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 transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming the hydrafed oxide in all dilute adds except HF. Chemical Compatibility - Soluble in concentrated HCI, HF, H3PO4 H2SO4 and HNO3. Avoid neutral to basic Atomic Weight, Valence; Coordination Number; Chemical Form in Solution - 47.87 +4 6 Ti(F)6-2

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

reported density. Do not pipette from the container. Do not refurn removed aliquots to container. - 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 renorded density. Do not bipette from the container. Do not return removed alticular to container.

Twitte sociate in the secied 101 beg, trainspleaded for the orderiver in the shalfy 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. - While stored in the sealed TCT bag, transpiration of this CRWRM is negligible. After opening the sealed TCT bag, transpiration in a negligible in the capture managed in the capture

- Store between approximately  $4^{\circ}$  - 30° C while in sealed TCT bag.

Page 4 of 4

Chairman / Senior Technical Director

- Sealed TCT Bag Open Date:

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

norganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.859.5790; 540.855.3030, Fax: 540.555.3012; Inorga - Reference Material Producer - Accredited / A2LA Certificate Number 883.02 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- This CRMRM 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 CRMRM being stored and handled in accordance with the instructions given in Sec. 7.1.

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

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

Thomas Kozikowski Manager, Quality Control Certificate Approved By:

thibils Validity

- June 17, 2027 11.2 Lot Expiration Date

June 17, 2022 11.1 Certification Issue Date

Paul Gaines Certifying Officer:

0.Sr

0.11

CERTIFIED WEIGHT REPORT:

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



## K S98 | Reference Material CRM | /24







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

		060724				060724			ached pg.) NIST	LD50 SRM	S S S S S S S S S S S S S S S S S S S	1		
	Capeate	Giovanni Esposito	2	V	lord	Pedro L. Rentas		SDS Information	(Solvent Safety Info. On Attached pg.)	OSHA PEL (TWA)				
	Lievannie		1	!	N. P.				(Solve	CAS#	13520-83-7			
	Lieva	Formulated By:			13	Reviewed By:		Expanded	Uncertainty	+/- (ug/mL)	2.2			
		Nitric Acid				1-	ij		Final	Conc. (ug/mL)	1000.0			
Solvent:	Nitric Acid	40.0	(mf.)						Initial	Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL)	10001.5		near]	
Lot #	24002546	2.0%				sinty			Nominal	Conc. (ug/mL)	1000		2.D# [Count] [Linear]	
0						Balance Uncertainty	Flask Uncertainty		Uncertainty	Pipette (mL)	0.084		92.D# [c	
KI U						5E-05	0.100		Initial	Vol. (mL)	200.0		sec]:570	
	=	3		(၃			2000.07		Dilution	Factor	0.1000		[ 23.254 sec]:5709	
	57092 060724 Uranium (11)		060727	Ambient (20 °C)	1000	<b>6UTB</b>	d to (mL):		Lot	Number	58192 041524			
			*	- 24	<u></u>	:-	was dilute		Part	Number	58192		trum N	
CERTIFIED WEIGHT REPORT:	Part Number: Lot Number: Description:		Expiration Date:	Recommended Storage:	Nominal Concentration (µg/mL):	NIST Test Number:	Volume shown below was diluted to (mL):			Compound	1. Uranyl nitrate hexahydrate (U)		[1] Spectrum No.1	

1.0E6	5.0E5	m/z-> 5.0E4	2.5E4	m/z-> 1.0E6	S.OES	\.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
[1] Spectrum No.1		0		011		C
		O		120		000
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ount] [Line		80		081		
ar]		O e		160		
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		990		-@ -		
		Oe		081		
		100		200		

Lot # 060724





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

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

							Trace M	etals	Verificat	tion	by ICP-M	VIS CE	(lm/p/							
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æ	<0.02	ő	<0.05	Ā	200	á	6	N.	20:00	; <u>}</u>	70:05	H C	70.05	0	40.02 40.02	S.	<b>40.02</b>	Zu	<b>40.02</b>	_
The same of					70:00	,	20.02	DAT.	20.02	4	702	Š	<0.02 <0.02	Ĕ	5	F	5007	-	2000	-

(T) = Target analyte

## Physical Characterization:

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





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

All standard containers are meticulously cleaned prior to use.

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

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

\* 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 WEIGHT REPORT:

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



## Certified Reference Mater



fied Refe	rence Mai	fied Reference Material CRM	•		ANAB IS AR-153 https://ab	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	dited
¥	Z #107	7	2	2/11/0	<b>&gt;</b>		
Solvent:	Solvent: 24002546 Nitric Acid	Nitric Acid		A CONTRACTOR OF THE PARTY OF TH			
2%	40.0	Nitric Acid		Formulated By:	Benson Chan	031524	
	(III)			M	Hento		
Uncertainty				Reviewed By:	Pedro L. Rentas	031524	

Part Number: Lot Number:		19		Solvei	Solvent: 24002546 Nitric Acid	46 Nitr	ic Acid		A STATE OF THE STA	1		
Description:	Strontium (Sr)	(Sr)		C)	2% 40.0		Nitric Acid	, Itt	Formulated Bv:	Benson Chan	8	031524
Expiration Date:	031527							L	7	1		
Recommended Storage:	Ambient (20 °C)	(2)							1	A Comment of the Comm	1	
Nominal Concentration (µg/mL):	1000								June 1	Kena	΄ Δ	
NIST Test Number:	6UTB		5E-05 Ba	5E-05 Balance Uncertainty	<u>~</u>			Œ	Reviewed By:	Pedro L. Rentas		031524
Weight shown below was diluted to (mL); 2000.07	as diluted to (mL):	2000.07	0.100 Fla	0.100 Flask Uncertainty				I				
									Expanded	SDS Information	mation	
	Lot	Nominal	Purity U	Nominal Purity Uncertainty Assay	say Target		Actual Act	Actual U	Uncertainty	(Solvent Safety Info. On Attached pg.)	On Attached pg.)	TSIN
Compound	RM# Number Conc. (µg/mL) (%) Purity (%) (%)	Conc. (ug/mL)	(%)	urity (%) (9	6) Weight (g)		Weight (g) Conc. (µg/mL) +/- (µg/mL)	ug/mL) +	-/- (ug/mL) CAS#	# OSHA PEL (TWA)	NA) LD50	SRM

1. Strontium nitrate (Sr)		IN017 SRZ022018A1	1000	89.997	0.10	41.2	4.85470	4.85502	1000.1	2.0	10042-76-9	NA	orl-rat >2000mg/kg 3153a
5.0EG	[1] Spect	[1] Spectrum No.1	[ 14.495 sec]:58138.D# [Count] [Linear]	sec]:581	38.D#	Coun	nt] [Linea						
2.5E6												-90-000 Market Market	
m/z->⊶ 1.0E6	•	10 20		OG	0		.00	09	0,		80	. <u>0</u>	100
5.0ES	unggap a militing di danggap kili. Ayaka sakairi ku												
m/z-≫ 5.0E6		110 120		130	041		150	160	0.71		180	081	200
2.5E6													
V-z/H	4	220		230	240	14	250	260					





Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

						Ī	Trace Me	etals	Verifica	tion	by ICP-I	ξS	(na/mr)						
Name of	THE RESIDENCE OF THE PERSON NAMED IN	MARKET STATES	WITH STATE OF	Section 1	Control of the last	Separate Sep	The later little	THE REAL PROPERTY.	Series and designation of the least		Management of the last of the	Service of the last	в	William .	STATE OF THE PERSON NAMED IN	<b>MANAGEMENT</b>	SHARWARD CONTRACTOR		The second second second
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æ	<0.01	ర	<0.02	త్	<0.02	윤	<0.2	H	<0.2	д	<0.02	Z.	40.02	6	! -	<u> </u>	20:05	>	
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																		1	

(T) = Target analyte

## Physical Characterization:

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



Certified by:

1. P

Lot # 031524

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

<sup>\*</sup> 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.

<sup>\*</sup> 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

| MS982 | R: 6/11/24







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

			Comment Comment of the second	Nitric Acid Formulated By: Benson Chan 071423	7		flesh Mento	Reviewed By: Pedro L. Rentas 071423		Expanded SDS Information	Final Uncertainty (Solvent Safety Info. On Attached pg.) NIST	Vol. (ml.) Pipette (ml.) Conc. (µg/ml.) Conc. (µg/ml.) Conc. (µg/ml.) +/- (µg/ml.) CAS# OSHA PEL (TWA) LD50 SRM
Solvent:	Nitric Acid			40.0	(mL)						Initial	Conc. (µg/mL
Lot #	21110221			2.0%				ainty	£,		Nominal	Conc. (µg/mL)
								Balance Uncertainty	Flask Uncertainty		Uncertainty	Pipette (mL)
								SE-05	0.058		Initial	Vol. (mL)
			(Zr)			(),(			2000.02		Dilution	Factor
	57040	071423	Zirconium (Zr)		071426	Ambient (20 °C)	1000	6UTB	id to (mL):		Lot	Number
									was dilute		Part	Number
CERTIFIED WEIGHT REPORT:	Part Number:	Lot Number:	Description:		Expiration Date:	Recommended Storage:	Nominal Concentration (µg/mL):	NIST Test Number:	Volume shown below was diluted to (mL):			Compound

Zirconyl chloride	1. Zirconyl chloride octahydrate (Zr)	58140	58140 070621	0.1000	200.0	0.084	1000	10000.3 1000.0		2.2	13520-92-8	NA	NA	¥ Z
7	[1] Spec	[1] Speatrum No.1		[ 41.153 sec]:57040.D# [Count] [Linear]	ec]:570	40.0# [	Count (L	inear						
<b>16</b>	5.0 E6													
7,4% 1.0E	/z-:	0	O N	00		0	00	0	0.7	•	0	0	00	
ú)	6.0E7													
™.Z~3	0	011	0 20 0	08		04	97	160	170	4~	081	160	000	
ΰ	5.0E7													
K-2/LL		0 10	220	230		240	250	280						

Lot # 071423



## 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):

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	y ICP-MS	CONTRACTOR OF THE PERSONS	800	70.00	<b>40.02</b>	5	70.05	20.05		Q0:02	200	3010	<b>€</b> 1.2
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	Verificat		SUCH	*0.0*	€0.02	5	10.07	<0.02	ç	705	₹0.02	2	70.02
I	stals		E	i	3	Ma	TA S	Mn	ń	70	W	22	DAI
	Trace Me		<0.00		<b>40.02</b>	200	1000	20.05 Q	5	707	Ø.02	2000	70:05
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(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).







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Lot # 071423

Part # 57040

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### R; 01/03/24 M6033 Certified Reference Material CRM

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

m/z->	1.006	2.016	m/z->	N O	5.0E6	m/z->	1.1.1.	2.5E5	6-6	5.0E5	Aluminum nitrate nonahydrate (Al)	Compound	Weight shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Recommended Storage:	Fyniret	Des	Fan Lot	CERTIFIED WEIGHT REPORT:
210			110			10				[1] Spectrum No.1	11	RM#	below was dilut	Number:	(µg/mL):	Storage:	Evniration Data:	Description:	Fart Number:	
220			120			20				_	IN022 ALM112021A1	Lot Number Co		6UTB	10000	Ambient (20 °C)	011636	Aluminum (Al)	011623	)
230			130			30				5.014 sec]:	10000 99.999	Nominal Purity Conc. (µg/mL) (%)	2000.02 0.05	5E-0		<u>.</u>				
240			140			40				15.014 sec]:58113.D# [Count] [Linear]	9 0.10 7.30	Purity Uncertainty Assay (%) Purity (%) (%)	0.058 Flask Uncertainty	5E-05 Balance Uncertainty			2%		Solvent:	<b>&gt;</b>
250			150			50				Count] [Line	0 273.9779	ay Target ) Weight (g)		<b>y</b>		(1117)			it: 20510011	
260			160			60				»ar]	274.0078 1	Actual Weight (g) Con					Nitric Acid		Nitric Acid	
			170			70					10001.1 2	Actual Unce Conc. (µg/mL) +/- (		Revi			Form	7	~e	7
			180			80					20.0 7784-27-2	Expanded (Si Uncertainty (Si +/- (µg/mL) CAS#		Reviewed By:	tach		Formulated By:	200 A contract	L'internation of	
			190			90					2 mg/m3	SUS Information Support Safety Info. On Attacon OSHA PEL (TWA)		Pedro L. Rentas	pena		Giovanni Esposito	(	7	
			200			100						Attached		38	8		sito		e de	
											orl-rat 3671 mg/kg 3101a	pg.) NIST LD50 SRM		011623			011623			

Nitric Acid 69%

Rew. 1 — 08/0/12025 Pare 1 — 16034, M6034 m6035, M6038, m6036, Certificate of Analysis





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

Manufactured Date: 2024-03-26 Retest Date: 2029-03-25

Revision No.: 0

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

>>> Continued on page 2 >>>





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

n Result	Result
< 1.0 ppb	< 1.0 ppb
16 ppb	16 ppb
< 10 ppb	< 10 ppb
< 1.0 ppb	< 1.0 ppb
< 5.0 ppb	< 5.0 ppb
< 1.0 ppb	< 1.0 ppb
< 5.0 ppb	< 5.0 ppb
< 5.0 ppb	< 5.0 ppb
< 10.0 ppb	< 10.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
10 par/ml	
3 par/ml	3 par/ml

Nitric Acid 69% CMOS





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

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Jamie Croak
Director Quality Operations, Bioscience Production

Nitric Acid 69%

Rew. 1 — 08/0/12025 Pare 1 — 16034, M6034 m6035, M6038, m6036, Certificate of Analysis





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

Manufactured Date: 2024-03-26 Retest Date: 2029-03-25

Revision No.: 0

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

>>> Continued on page 2 >>>





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

n Result	Result
< 1.0 ppb	< 1.0 ppb
16 ppb	16 ppb
< 10 ppb	< 10 ppb
< 1.0 ppb	< 1.0 ppb
< 5.0 ppb	< 5.0 ppb
< 1.0 ppb	< 1.0 ppb
< 5.0 ppb	< 5.0 ppb
< 5.0 ppb	< 5.0 ppb
< 10.0 ppb	< 10.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
10 par/ml	
3 par/ml	3 par/ml

Nitric Acid 69% CMOS





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

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Jamie Croak
Director Quality Operations, Bioscience Production

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





paper m6039 Certificate of Analysis m6040

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

Revision No.: 0

Test	Specification	Result
ACS – Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.192
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 (PO <sub>4</sub> )	≤ 0.05 ppm	0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO <sub>3</sub> )	≤ 0.8 ppm	0.3 ppm
Ammonium (NH <sub>4</sub> )	≤ 3 ppm	< 1 ppm
Trace Impurities - Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (AI)	≤ 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 >>>





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

Test	Specification	Result
Trace Impurities - Lead (Pb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Lithium (Li)	≤ 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
Frace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Frace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Frace Impurities – Thallium (TI)	≤ 5.0 ppb	< 2.0 ppb
Frace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.4 ppb
race Impurities – Titanium (Ti)	≤ 1.0 ppb	0.2 ppb
race Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
race Impurities – Zinc (Zn)	≤ 5.0 ppb	< 0.2 ppb
race 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

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, Bismuth, Cobalt, Lithium.

Lead,

Beryllium, Cerium, Indium,

Nickel. Uranium

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

ANALYTE	<b>CERTIFIED VALUE</b>	ANALYTE	<b>CERTIFIED VALUE</b>
Barium, Ba	10.01 ± 0.04 μg/mL	Beryllium, Be	10.01 ± 0.05 μg/mL
Blsmuth, Bl	10.01 ± 0.06 µg/mL	Cerlum, 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
Со	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
Li	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

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

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

X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub>

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

X<sub>a</sub> = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u<sub>char a</sub> = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

u<sub>ts</sub> = 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 <u>Terms and Conditions of Sale.</u>

  <a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. 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

### 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

<ul> <li>Sealed TCT Bag Open Date</li> </ul>	o:

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

### **Certifying Officer:**

Paul Gaines
Chairman / Senior Technical Director

Paul R. Simo

### 800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

58111 122223

Sodium (Na)

Lot Number: Description:

Nominal Concentration (µg/mL):

**NIST Test Number:** 

**6UTB** 10000

Weight shown below was diluted to (mL):

3000.4

0.06 Flask Uncertainty 5E-05 Balance Uncertainty

RW#

Number Lot

Nominal

Purity

Uncertainty Assay Purity (%)

Target

Actual

8

38

Recommended Storage:

Ambient (20 °C)

122226

**Expiration Date:** 

Lot # M5807

Solvent:

24002546 Nitric Acid

2%

60.0 (III)

Nitric Acid

Formulated By: 13817 P Aleah O'Brady Back

Reviewed By: Pedro L. Rentas

122223

22223

Actual Uncertainty Expanded (Solvent Safety Info. On Attached pg.) **SDS Information** TSIN

CAS#

SE

1. Sodium nitrate (Na) IN036 NAV01201511 Conc. (µg/mL) 10000 98.999 0.10 26.9 111.5406 Weight (g) Weight (g) Conc. (µg/mL) 111.5479 10000.7 +/- (µg/mL) 20.0 7631-99-4 OSHA PEL (TWA) 5 mg/m3 ori-rat 3430 mg/kg 3152a

1 m/z-> 17/z-Y m/z-> N.5E6 5.0E6 2.5E6 5.0E6 2.5E5 5.0E5 [1] Spectrum No.1 210 110 0 220 120 NO. [ 8.935 sec]:58111.D# [Count] [Linear] 130 230 30 140 240 6 150 250 50 160 260 0 170 70 180 80 190 90 100 200

Part # 58111



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.

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
M5738 M5739 M5740 M5741 M5742

Refine your results. Redefine your industry.

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:

6020ISS

Lot Number:

S2-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**  $10.00 \pm 0.03 \,\mu g/mL$ 

**ANALYTE** Bismuth, Bi **CERTIFIED VALUE** 

 $10.00 \pm 0.05 \,\mu g/mL$ 

Holmium, Ho

 $10.00 \pm 0.05 \,\mu g/mL$ 

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

 $10.00 \pm 0.04 \, \mu g/mL$ 

Density:

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

**Assay Information:** 

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Bi	ICP Assay	3106	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
Tb	ICP Assay	3157a	100518
Tb	EDTA	928	928
Tb	Calculated		See Sec. 4.2
Υ	ICP Assay	3167a	120314
Υ	EDTA	928	928
Υ	Calculated		See Sec. 4.2

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

	· ·
Characterization of CRM/RM by Two or More Methods	Characterization of CRM/RM by One Method
Certified Value, X <sub>CRM/RM</sub> , where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X <sub>CRWRM</sub> , where one method of characterization is used is the mean of individual results:
$\begin{split} & \textbf{X}_{\text{CRM/RM}} = \Sigma\{w_i\}  \{X_i\} \\ & \textbf{X}_i = \text{mean of Assay Method I with standard uncertainty } \textbf{U}_{\text{char I}} \\ & \textbf{w}_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & \textbf{w}_i = (1/u_{\text{char I}})^2 /  (\Sigma(1/u_{\text{char I}})^2) \end{split}$	X <sub>CRM/RM</sub> = (X <sub>a</sub> ) (u <sub>cher a</sub> )  X <sub>a</sub> = mean of Assay Method A with  u <sub>cher a</sub> = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty ( $\pm$ ) = $U_{CRM/RM}$ = $k$ ( $u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ta}$ ) $^{1/2}$ $k$ = coverage factor = 2 $u_{char} = (2((w_i)^2 (u_{char})^2)]^{1/2}$ where $u_{char}$ i are the errors from each characterization method $u_{bb} = b$ obtile to bottle homogeneity standard uncertainty $u_{lts} = long$ term stability standard uncertainty (storage) $u_{tb} = t$ transport stability standard uncertainty	CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ $k = coverage\ factor = 2$ $U_{char\ a} = the\ errors\ from\ characterization$ $U_{bb} = bottle\ to\ bottle\ homogeneity\ standard\ uncertainty$ $U_{tts} = long\ term\ stability\ standard\ uncertainty\ (storage)$ $U_{tts} = transport\ stability\ standard\ uncertainty$

### **Certified Abundance:**

### **IV's Certified Abundance**

<u>Isotope</u>	Atom %		
Lithium Li6	95.6 ± 0.3		
Lithium Li7	$4.4 \pm 0.1$		

### 4.0 TRACEABILITY TO NIST

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

### **4.1 Thermometer Calibration**

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/A

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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 Both

### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director

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 <a href="miller.ross@epa.gov">miller.ross@epa.gov</a>. 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, Tl, 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



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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

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

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

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

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

ICSA: M5873

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-MS ICSA-0803, AND ICSA-0803 MIXED WITH ICSB-0803								
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)	
Al	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.

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 <a href="miller.ross@epa.gov">miller.ross@epa.gov</a>. 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
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### (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, Tl, 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:





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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

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

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

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

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

ICSA: M5873

	Table 1.		VALUES" FOI 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)
Al	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.

www.absolutestandards.com



# Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: 57051 120523 BTU9 1000 120526 Ambient (20 °C) Antimony (Sb) 3000.41 0.058 5E-05 Flask Uncertainty Balance Uncertainty 24002546 Lot # 2.0% M.5802 Nitric Acid Solvent: 0.00 MSBOS Nitric Acid Formulated By: Reviewed By: Pedro L. Rentas Lawrence Barry 120523 120523

1. Antimony (Sb)

58151

100923

0.1000

300.0

1000

10001.4

1000.0

7440-36-0

0.5 mg/m3

orl-rat 7000 mg/kg 3102a

Number Part

Number Ď

Vol. (ml.)

Pipette (ml.) Conc. (µg/ml.)

Conc. (µg/mL)

Conc. (µg/ml.)

+/- (µg/mt.) Uncertainty Expanded

CAS#

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

LD50

SRM NIST SDS Information

Final

Dilution Factor

Initial

Uncertainty

Nominal

Compound

m/z->	1.057	m/z-> 2.0E7	2. 6 8	5.0E5	2.6E6	6.OE6
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Part # 57051



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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(1) = 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 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).

Printed: 1/16/2024, 3:48:48 PM

Part # 57051

Lot # 120523

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



# Certified Reference Material CRM

M6030

ANAB ISO 17034 Accredited

CERTIFIED WEIGHT REPORT: Part Number: Lot Number: 57047 122823 R = 8 | 5 | 24 Solvent: 24002546 Lot # Nitric Acid

Nominal Concentration (µg/mL): NIST Test Number: Recommended Storage: **Expiration Date:** 1000 **6UTB** Ambient (20 °C) 122826 5E-05 Balance Uncertainty 2%

> <u>E</u> 80.0

> > Nitric Acid

Formulated By:

Benson Chan

122823

Description:

Silver (Ag)

Weight shown below was diluted to (mL): 4000.30 0.058 Flask Uncertainty

1. Silver nitrate (Ag) Compound IN035 J0612AGA1 RM# Number 헏 Conc. (µg/mL) 1000.0 Nominal Purity Uncertainty Assay 8 Purity (%) 0.10 63.7 38 Weight (g) 6.27992 Target Weight (g) Conc. (µg/mL) 6.27998 Actual 1000.0 Actual +/- (µg/mL) Uncertainty Expanded 2.0 7761-88-B CAS# (Solvent Safety Info. On Attached pg.) SDS Information 10 ug/m3 Z 3151

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

NIST SRM

Reviewed By: Pedro L. Rentas 122823

www.absolutestandards.com



							race Me	letals	Verificat	tion	by ICP-I	S	$\mu$ g/mL)						
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Physical Characterization:

(T)= Target analyte

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

Certified by:

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

## Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

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

R: 03/16/23 MS473 MS474, MS475, MS Lot #

CERTIFIED WEIGHT REPORT:

Part Number:

56138 082922

Solvent: 20510011

Nitric Acid

2% 20.0 Nitric Acid

<u>P</u>

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000 Recommended Storage:

Ambient (20 °C) 082925

**Expiration Date:** 

Description: Lot Number:

Strontium (Sr)

Weight shown below was diluted to (mL):

1000.12

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> Formulated By: Lawrence Barry

Pedro L. Rentas

Reviewed By:

082922

082922

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

LD50

SRM SRM

10042-76-9 Ι₹ orl-rat >2000mg/kg 3153a

Strontium nitrate (Sr

IN017 SRZ022018A1

10000

41.2

24.2756 Weight (g)

20.0

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g) Conc. (µg/mL) +/- (µg/mL)

CAS#

Uncertainty

Expanded

닭

Nominal

Purity Uncertainty Assay

m/z-> m/z-> M/z-> 2.5E6 5.0E6 5.0E5 1.0E6 2.5 € 6 5.0E6 [1] Spectrum No.1 210 110 10 220 120 20 [ 14.495 sec]:58138.D# [Count] [Linear] 230 130 30 99.997 140 240 0.10 40 250 150 50 24.2758 260 160 60 10000.1 170 0 80 190 90 200 100

1 of 2

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

П				П		Ш	Trace Me	tals	Verifica	tion	by ICP-	S	μg/mL)	Н					
				I		i				ı	8	ı		۱					
Α	<0.02	${\mathfrak S}$	<0.02	Dу	<0.02	H	<0.02	Ľ.	40.02	<u>Z</u> .	<0.02	P.	<0.02	Se	<0.2	4T	<0.02	¥	<0.02
SЬ	<0.02	က္အ	<0.2	缸	△0.02	Но	<0.02	Lu	<0.02	子	<0.02	Re	<0.02	Si	<0.02	Te	∆ 0.02	Ϥ	<0.02
As	<0.2	ප	<0.02	땹	<0.02	F	<0.02	Mg	<0.01	္တ	<0.02	₽	<0.02	Ag	<0.02	∄	<0.02	<	<0.02
Ва	<0.02	స	<0.02	ନ୍ଦ	<0.02	ī	<0.02	M	<0.02	Pd	<0.02	₽ B	<0.02	N <sub>2</sub>	<0.2	∄	<0.02	4	<0.02
Be	<0.01	<del>Ω</del>	△0.02	ନ୍ଥ	<0.02	듔	<0.2	Нg	<0.2	Р	<0.02	ᇟ	<0.02	Sr	Ţ	Tm	<0.02	<b>~</b>	<0.02
Bi	40.02	င္ပ	<0.02	Ge	<0.02	La	<0.02	Μo	<0.02	뫈	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	₽ C	<0.02	Au	<0.02	Рь	<0.02	Nd	40.02	×	<0.2	Sc	<0.02	Ta	<0.02	∄	<0.02	Zr	<0.02

Physical Characterization:

(T)= Target analyte

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

Certified by:

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

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

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

Part # 56138

## Absolute Standards, Inc. 800-368-1131

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# Certified Reference Material CRM

M6023

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

		Weight shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Recommended Storage:	Expiration Date:		Description:	Lot Number:	Part Number:	CERTIFIED WEIGHT REPORT:
Lot		ted to (mL):	8TUB	1000	Ambient (20 °C)	062727		Thalllum (TI)	062724	57081	
Nominal		2000.1			၀ (၄)						
Purity Uncertainty Assay		0.10 Flask Uncertainty	5E-05 Balance Uncertainty				2%			Solvent:	
Target						(mL)	40.0			Solvent: 24002546	Lot #
Actual							Nitric Acid			Nitric Acid	
Actual											
Uncertainty	Expanded		Reviewed By:	Juna	1		Formulated By:	4	TO ST	>	
(Solvent Safety Info. On Attached pg.)	SDS Information		Pedro L. Rentas	" human	A A		Aleah O'Brady	0	San O To asign	7	
ched pg.) NIST			062724				062724			,	
7											

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM

-z/m	5.0E5	1.0E6	m/z->	5000	1.0€4	1.0E6	2.0E6	
N			-1				El opegrum No.	
210			10		ö		3	
220			120		N O			
							4 0	
230			130		<b>9</b>		[ ]4.044 sec]:57081.D# [Count] [Linear]	
240			<u> </u>		4		57081.	
ō			140		40		<u> </u>	
250			<b>1</b>		OI.			
							000000000000000000000000000000000000000	
N			160		60			
			4		70			
			170		0			
			180		80			100
			190		90			or any
			200		100			
			ŏ		ŏ			See all see al
								0

Part # 57081



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

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

		ᄧ	10	Ħ.	Ве	, to	ಸ ತ	AS		Sb		<u>&gt;</u>		Ī		
		40.02	20.02	3	<u>6</u> .01	70.02	3	4.6	5	<u> </u>		A) 02				
	ŀ	ဂ္	8	)	ç	Ç	3	g	<u> </u>	ري و	-	2		l		
		40.02	20.02		A).03	20.03	3	40.02		<u>ه</u>	10.01	20.02				
		A	Ç,	9	<u>.</u>	Ga	2	E E	1 1	Į	5	7	A PROPERTY OF			
	20,02	3	40.02	0.01	3	20.02	3	<b>∆</b> 0.02		200	10.04	2000	CATALOGUE SANCES			
	100	ğ	Į,	,	<u>.</u>	Ę	•	ď	110	ᄪ	121	321			_	
	70.02	3	<b>∆</b> 0.02	ć	2	40.02		<b>∆</b> .02	20.02	3	20.02	200		ומכפ ויונ	TOO M	
		Ž	Mo	21.1	Ę	M	q	Mg	100	T 21	E			Calo	7	
(T) = Target analyte	70.02	3	& 20.02	7.0	5	40.02		<u>A</u>	20.02	3	20.02	200		ACHILLA	くのがない	
et anal	F	4 .	7	7	,	Pd	Ş	ခွ	IND	ź	2		8	ונוטוו	÷.	
yte	2.05	<b>b</b>	<u>\$</u>	20,02	Š	<0.02	10,02	3	20.02	3	<0.02			Dy ICE-	3	
	SC	,	S E	X.	,	2	I	P.	Ke	;	7			WU C	20	
	40.02	20:02	200	40.02		<0.02	10.04	3	20.02	2	<u>&amp;</u>			ug/mL)		
	Ta	,	<i>n</i>	Si		ž	3	<u> </u>	S	?	လ လ		I			
	40,02	40.04	3	A.02	i	40.2	20.03	3	<b>∆</b> 0.02	· i	A).2					
	11	011	?	ď	ŀ	#	1.1	1	Te		7					
	40.02	70.02	3	40.02	40.04	AD 03	_	3	<u>6</u> ,02	60.00	<0.03					
	Zr	112	7	×	ć	ş	<	ă Y	_ _		W.	Talenta Commission				
	40.02	20.02	3	<b>∆</b> 0.02	70.02	3	<b>∆</b> .02		A 0.02	20.02	28	TOTAL CONTRACTOR AND ADDRESS OF THE PARTY OF				

## 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.

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**Certified Reference Material CRM** M5545,M5546,M5547,M5548 RD:05/08/2 RD:05/08/2023



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

050223

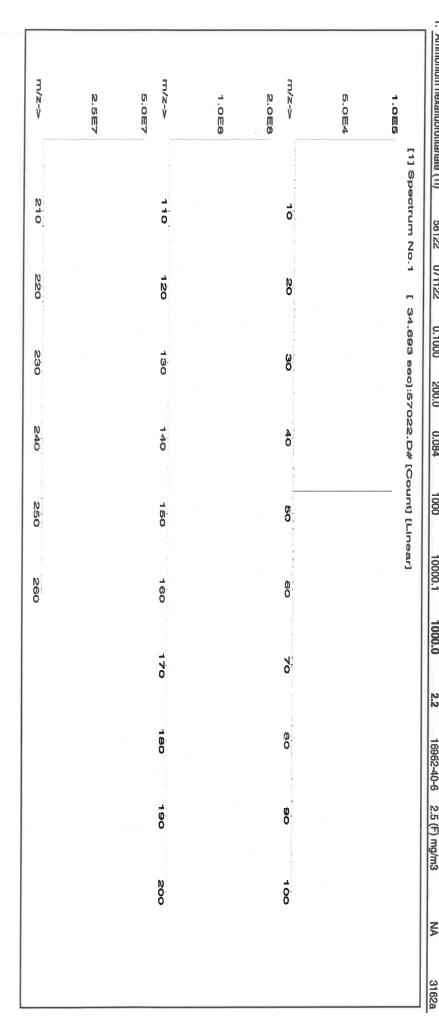
CERTIFIED WEIGHT REPORT: Recommended Storage: **Expiration Date:** Part Number: Description: Lot Number: 57022 050223 Ambient (20 °C) 050226 Titanium (Ti) 21110221 2.0% Lot # Nitric Acid Solvent: 画 40.0 Nitric Acid Formulated By: Lawrence Barry

1 Ammonium heveftioretitemete (TI) EB139 071199 0 1000 0000 0000	Compound			Volume shown below was diluted to (mL): 2000.02	NIST Test Number:
500	Number	Part		was dilute	
074400	Number Number	Lot		id to (mL):	6UTB
	Factor	Dilution		2000.02	
9	Vol. (ml.)	initial		0.058	5E-05
	Pipette (mL)	Initial Uncertainty Nominal		0.058 Flask Uncertainty	5E-05 Balance Uncertainty
	Vol. (ml.) Pipette (ml.) Conc. (µg/ml.) Conc. (µg/ml.) Conc. (µg/ml.) +/- (µg/ml.)	Nominal		\$	bainty
	Conc. (µg/mL)	Initial			
	Conc. (µg/mL)	Final			
	+/- (µg/mL)	Uncertainty	Expanded		Reviewed By:
	CAS#	(Solvi			
	CAS# OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)	SDS Info		Pedro L. Rentas
	WA)	o. On Attac	<b>SDS Information</b>		as
	LD50	thed pg.)			050223
	SRM	NIST		1	[23]

Nominal Concentration (µg/mL):

1000

CDI	- 750	CAS# OSHA PEL (TWA)	#SA?	+/- (m/ml)	Cone (un/ml)	Conc. (ug/ml.)	Vol. (ml.) Pipette (ml.) Conc. (ua/ml.) Conc. (ua/ml.) Conc. (ua/ml.)	Pipette (mL)	Vol. (mL)	Factor	Number	Number Number	pound
NIST	tached pg.)	(Solvent Safety Info. On Attached pg.	(\$)	Uncertainty	Final	Initial	Nominal	Uncertainty Nominal	initial	Dilution	Lot	Part	
	'n	SDS Information		Expanded									



# Certified Reference Material CRM



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

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

В	B	Be	Ba	As	Ş	2		Γ	
40.02	40.02	40.01	40.02	<0.2	40.02	<0.02	THE REAL PROPERTY.		
δ	ç	ជ	S	රී	ಭ	S			
40.02	40.02	40,02	△0.02	40.02	402	<0.02			
Au	දි	ಜ	පි	핕	택	Дy			
40.02	<b>60.02</b>	<0.02	40.02	<0.02	40.02	40.02			
Pb	E	귡	Ħ	F	Но	H	DESCRIPTION OF THE PROPERTY OF		
40,02	40.02	<b>&amp;</b> 0.2	<b>40,02</b>	<b>∆0,02</b>	A0.02	<b>√</b> 0.02	MANUAL PROPERTY.	I de la	Tanan M
Nd	Мо	Hg	Mn	Mg	Ţ	Ц		ecais	2
<0.02	<0.02	40.2	<b>40,02</b>	40.01	<0.02	<0.02		VEHICA	No. Little
×	¥	Þ	굔	ô	\$	Zi.	Milwire		-
40.2	40.02	40.02	40,02	<b>6</b> .02	<0.02	40.02	Section 1	DY ICE-P	3
જ	Sm	Ru	Rb	R	R	Pr	056233000	SA CHI	5
40.02	40.02	<0.02	40.02	<0.02	40.02	<0.02		<i>y</i> / IIIL/	'
Ta	S	Sr	Z	Ag	Si	Se			
<0.02	40,02	40.02	<u>0</u> 2	40.02	40.02	40.2	DESTRUCTIONS		
Ħ	Sn	ī	Ħ	Ħ	7	41			
	<b>∆</b> .02	<b>6</b> 002	<u>&amp;</u> 20.02	0,02	40.02	40.02			
72	Zn	۲	\$	<	٦	W	Total Specia		
40,02	40,02	40,02	40.02	40,02	<b>40.02</b>	40,02	Mark Sharing		

(I)= larget analyte

## Physical Characterization:

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

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