

8900, Fax: 908 789 8922

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

Order ID: Q1939

Test: Mercury, Metals ICP-TAL

**Prepbatch ID:** PB167832,PB167841,

**Sequence ID/Qc Batch ID:** LB135655,LB135674,LB135689,LB135699,

### Standard ID:

MP84041,MP85241,MP85243,MP85513,MP85520,MP85522,MP85524,MP85526,MP85529,MP85530,MP85531,MP85532,MP85533,MP85534,MP85535,MP85536,MP85537,MP85538,MP85539,MP85540,MP85541,MP85543,MP85545,MP85546,MP85547,MP85549,MP85551,MP85552,MP85553,MP85554,MP85555,MP85556,MP85557,MP85558,

### Chemical ID:

 $\begin{array}{l} M4251, M4583, M4916, M5062, M5429, M5466, M5467, M5470, M5471, M5581, M5658, M5747, M5748, M5751, M5798, M5799\\ , M5800, M5801, M5811, M5814, M5815, M5816, M5817, M5820, M5875, M5882, M5884, M5942, M5959, M5962, M5970, M5985\\ , M5997, M6005, M6016, M6021, M6023, M6028, M6030, M6032, M6058, M6076, M6077, M6125, M6126, M6127, M6128, M613\\ , M6138, M6142, M6144, M6145, M6146, M6150, M6151, M6152, M6155, M6159, M6159, M6161, W3112, \\ \end{array}$ 





### **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
169	1:1HNO3	MP84041	01/14/2025	07/14/2025	Eman Mughal	None	None	Carabjit Gaswar
								01/16/2025
	1050 00000   1110100   1050 0000			0500.0			-	

**FROM** 1250.00000ml of M6126 + 1250.00000ml of W3112 = Final Quantity: 2500.000 ml

Recipe ID	NAME.	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
65	POTASSIUM PERMANGANATE SOLUTION 5 %	MP85241	04/16/2025	10/16/2025		METALS_SCA LE_3 (M SC-3)		04/29/2025

**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
67	SODIUM CHLORIDE - HYDROXYL- CHLORIDE	MP85243	04/16/2025	06/25/2025		METALS_SCA LE_3 (M SC-3)		04/29/2025
	SOLUTION							

FROM 20	000.00000ml of W3112 +	240.00000gram of M4251	+ 240.0000gram of M5884	= Final Quantity: 2000.000 ml

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Janvi Patel
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP85513	05/02/2025	05/03/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	

FROM 1.00000ml of M6158 + 2.50000ml of M5062 + 96.50000ml of W3112 = Final Quantity: 100.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe				Expiration	Prepared			Supervised By		
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel		
1346	Hg ICV SOLUTION	MP85520	05/02/2025	05/03/2025	Mohan Bera		METALS_PIP			
							ETTE_5 (HG	05/07/2025		
	A)									

**FROM** 2.50000ml of M6158 + 2.50000ml of M6161 + 245.00000ml of W3112 = Final Quantity: 250.000 ml

Recipe				<u>Expiration</u>	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel
1358	CCV (Hg 5.0 PPB SOLUTION)	MP85522	05/02/2025	05/03/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	05/07/2025

FROM 485.00000ml of W3112 + 5.00000ml of M6158 + 10.00000ml of MP85513 = Final Quantity: 500.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Janvi Patel
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	MP85524	05/02/2025	05/03/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	
-	·	-			•	•	A)	

FROM 2.50000ml of M6158 + 247.30000ml of W3112 + 0.20000ml of MP85513 = 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>	Janvi Patel
887	AQUA REGIA FOR HG ON 7471A	MP85526	05/02/2025	05/03/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	05/07/2025

FROM 150.00000ml of M6151 + 50.00000ml of M6158 = Final Quantity: 200.000 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 Janvi Patel		
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP85529	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP ETTE_5 (HG			
	A)									

FROM 1.00000ml of M6158 + 2.50000ml of M5062 + 96.50000ml of W3112 = Final Quantity: 100.000 ml

Recipe				<b>Expiration</b>	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel
1340	Hg 0.00 PPB STD	MP85530	05/05/2025	05/06/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	05/07/2025

**FROM** 2.50000ml of M6158 + 247.50000ml of W3112 = Final Quantity: 250.000 ml





**Metals STANDARD PREPARATION LOG** 

Recipe				<b>Expiration</b>	<u>Prepared</u>			Supervised By
<u>ID</u>   <u>V</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel
1341 F	Hg 0.2 PPB STD	MP85531	05/05/2025	05/06/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	05/07/2025

FROM 2.50000ml of M6158 + 247.30000ml of W3112 + 0.20000ml of MP85529 = Final Quantity: 250.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel
1342	Hg 2.5 PPB STD	MP85532	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	05/07/2025
							A)	

FROM 2.50000ml of M6158 + 245.0000ml of W3112 + 2.50000ml of MP85529 = Final Quantity: 250.000 ml





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### 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>	Janvi Patel
1343	Hg 5.0 PPB STD	MP85533	05/05/2025	05/06/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	05/07/2025
	0.50000 1.5040450 040.50000 1	514/0440					A)	

**FROM** 2.50000ml of M6158 + 242.50000ml of W3112 + 5.00000ml of MP85529 = Final Quantity: 250.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel
1344	Hg 7.5 PPB STD	MP85534	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	05/07/2025
							A)	

**FROM** 2.50000ml of M6158 + 240.00000ml of W3112 + 7.50000ml of MP85529 = Final Quantity: 250.000 ml



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### Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME.	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel
1345	Hg 10.0 PPB STD	MP85535	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	05/07/2025
							A)	

**FROM** 2.50000ml of M6158 + 237.50000ml of W3112 + 10.00000ml of MP85529 = Final Quantity: 250.000 ml

Recipe				<b>Expiration</b>	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Janvi Patel
1346	Hg ICV SOLUTION	MP85536	05/05/2025	05/06/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	05/07/2025

**FROM** 2.50000ml of M6158 + 2.50000ml of M6161 + 245.00000ml of W3112 = Final Quantity: 250.000 ml



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### Metals STANDARD PREPARATION LOG

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>	Janvi Patel
1351	ICB (Hg 0.00 PPB SOLUTION)	MP85537	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	05/07/2025
							A)	

**FROM** 2.50000ml of M6158 + 247.50000ml of W3112 = 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>	Janvi Patel
1358	CCV (Hg 5.0 PPB SOLUTION)	MP85538	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	05/07/2025

FROM 485.00000ml of W3112 + 5.00000ml of M6158 + 10.00000ml of MP85529 = Final Quantity: 500.000 ml



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### **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>	Janvi Patel	
1352	CCB (Hg 0.00 PPB SOLUTION)	MP85539	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP		
							ETTE_5 (HG	05/07/2025	
	A)								

**FROM** 495.00000ml of W3112 + 5.00000ml of M6158 = Final Quantity: 500.000 ml

Recipe				<b>Expiration</b>	<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>	Janvi Patel
1349		MP85540	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP	
	SOLUTION)						ETTE_5 (HG	05/07/2025

**FROM** 2.50000ml of M6158 + 247.30000ml of W3112 + 0.20000ml of MP85529 = 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 Janvi Patel
1350	CHK STD (Hg 7.0 PPB SOLUTION)	MP85541	05/05/2025	05/06/2025	Mohan Bera		METALS_PIP ETTE_5 (HG	
							A)	

FROM 2.50000ml of M6158 + 240.50000ml of W3112 + 7.00000ml of MP85529 = Final Quantity: 250.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Janvi Patel
68	STANNOUS CHLORIDE SOLUTION	MP85543	05/05/2025	05/06/2025		METALS_SCA LE_3 (M SC-3)		05/07/2025

FROM 450.00000ml of W3112 + 50.00000gram of M5882 + 50.00000ml of M6151 = Final Quantity: 500.000 ml



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### **Metals STANDARD PREPARATION LOG**

902 ICP AES CAL BLK ( SO/ICB/CCB) MP85545 05/02/2025 06/02/2025 Janvi Patel METALS_SCA METALS_PIP LE_3 (M SC-3) ETTE_1 (ICP 05/07/2025	Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
	902	ICP AES CAL BLK ( SO/ICB/CCB)	MP85545	05/02/2025	06/02/2025		_	_	

FROM 125.00000ml of M6151 + 2350.00000ml of W3112 + 25.00000ml of M6158 = Final Quantity: 2500.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
907	ICP AES STD S ( S5 )	MP85546	05/02/2025	06/02/2025		METALS_SCA LE_3 (M SC-3)		,

**FROM** 

5.00000ml of M5466 + 5.00000ml of M5471 + 5.00000ml of M5816 + 5.00000ml of M5820 + 5.00000ml of M5875 + 5.00000ml of M5970 + 5.00000ml of M5997 + 5.00000ml of M6076 + 5.00000ml of M6146 + 455.00000ml of MP85545 = Final Quantity: 500.000 ml



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### **Metals STANDARD PREPARATION LOG**

	Recipe <u>ID</u>	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
	910	ICP AES STD S4	MP85547	05/02/2025	06/02/2025		METALS_SCA LE_3 (M SC-3)	_	
A)									

**FROM** 50.00000ml of MP85545 + 50.00000ml of MP85546 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
909	ICP AES STD S3	MP85548	05/02/2025	06/02/2025		METALS_SCA LE_3 (M SC-3)	_	•

**FROM** 25.00000ml of MP85546 + 75.00000ml of MP85545 = Final Quantity: 100.000 ml



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### Metals STANDARD PREPARATION LOG

3913 ICP AES STD S2 MP85549 05/02/2025 06/02/2025 Janvi Patel METALS_SCA METALS_PIP	Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
	3913	ICP AES STD S2	MP85549	05/02/2025	06/02/2025		_	_	•

FROM 16.00000ml of MP85546 + 184.00000ml of MP85545 = Final Quantity: 200.000 ml

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By Sarabiit Jaswal
2950	ICP AES S1/CRI STOCK STD	MP85551	05/02/2025	06/02/2025		METALS_SCA LE_2 (M SC-2)		

**FROM** 

 $0.03000ml\ of\ M5798+0.03000ml\ of\ M6028+0.04000ml\ of\ M6137+0.05000ml\ of\ M5658+0.05000ml\ of\ M5811+\acute{0}.05000ml\ of\ M6030+0.05000ml\ of\ M6159+0.06000ml\ of\ M5747+0.10000ml\ of\ M5471+0.10000ml\ of\ M5751+0.10000ml\ of\ M5761+0.10000ml\ of\ M5761+0.10000ml\ of\ M5761+0.10000ml\ of\ M5761+0.10000ml\ of\ M5800+0.20000ml\ of\ M5748+0.20000ml\ of\ M5748+0.20000ml\ of\ M5799+0.20000ml\ of\ M6021+0.20000ml\ of\ M6023+0.20000ml\ of\ M6145+0.25000ml\ of\ M5466+0.25000ml\ of\ M6146+0.50000ml\ of\ M5814+0.50000ml\ of\ M6032+1.00000ml\ of\ M5942+1.00000ml\ of\ M6127+1.00000ml\ of\ M6138+1.00000ml\ of\ M6142+1.00000ml\ of\ M6144+2.00000ml\ of\ M5816+89.29000ml\ of\ MP85545=Final\ Quantity:\ 100.000\ ml$ 



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### **Metals STANDARD PREPARATION LOG**

2951 ICP AES S1/CRI WORK STD MP85552 05/02/2025 06/02/2025 Janvi Patel METALS_SCA METALS_PIP	Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabiit Jaswal
	2951	ICP AES S1/CRI WORK STD	MP85552	05/02/2025	06/02/2025		_	_	,

FROM 2.00000ml of MP85551 + 98.00000ml of MP85545 = Final Quantity: 100.000 ml

Recipe				<b>Expiration</b>	<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>	Sarabjit Jaswal
912	ICP AES ICV SOLN	MP85553	05/02/2025	06/02/2025		METALS_SCA		
						LE_3 (M SC-3)	ETTE_1 (ICP	05/07/2025

**FROM** 

0.02500ml of M5429 + 0.02500ml of M5815 + 0.02500ml of M5817 + 0.10000ml of M5467 + 0.25000ml of M6150 + 89.32500ml of M6058 + 10.00000ml of M6150 + 89.32500ml of MP85545 = Final Quantity: 100.000 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 Sarabiit Jaswal
904	ICP AES ICSA SOLN	MP85554	05/02/2025	06/02/2025		METALS_SCA LE_3 (M SC-3)	_	,
							A)	

**FROM** 25.00000ml of M6152 + 225.00000ml of MP85545 = Final Quantity: 250.000 ml

Recipe				<b>Expiration</b>	<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>	Sarabjit Jaswal
3494	ICP AES ICSAB SOLN-1	MP85555	05/02/2025	06/02/2025	Janvi Patel	METALS_SCA	METALS_PIP	
						LE_3 (M SC-3)	ETTE_1 (ICP	05/07/2025

**FROM** 

0.01000ml of M5815 + 0.01000ml of M5817 + 0.10000ml of M5470 + 0.10000ml of M5970 + 0.10000ml of M6077 + 10.0000ml of M6152 + 10.0000ml of M6155 + 79.68000ml of MP85545 = 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>PipetteID</u>	Supervised By Sarabjit Jaswal	
911	ICP AES CCV SOLN	MP85556	05/02/2025	06/02/2025		METALS_SCA LE_3 (M SC-3)			
A)									

**FROM** 50.00000ml of MP85545 + 50.00000ml of MP85546 = Final Quantity: 100.000 ml

Recipe				<b>Expiration</b>	<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>	Sarabjit Jaswal
919	ICP AES INTERNAL STD	MP85557	05/02/2025	06/02/2025		METALS_SCA	_	
						LE_3 (M SC-3)	ETTE_1 (ICP	05/07/2025

FROM 1.00000ml of M5959 + 10.00000ml of M5985 + 1969.00000ml of W3112 + 20.00000ml of M6158 = Final Quantity: 2000.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe ID 903	NAME ICP AES RINSE SOLN	NO. MP85558	Prep Date 05/02/2025	Expiration Date 06/02/2025	Prepared By Janvi Patel	ScaleID  METALS_SCA LE_3 (M SC-3)	ETTE_1 (ICP	Supervised By Sarabjit Jaswal 05/07/2025
FROM	200.00000ml of M6158 + 9800.00000	Oml of W311	2 = Final Qu	antity: 10000.00	00 ml		A) '	



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 #
Labpure	0919120 / Boiling Stones	26275770	07/07/2025	07/03/2020 / mohan	05/07/2020 / mohan	M4583
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 #
Inorganic Ventures	MSHG-10PPM / MERCURY HCI 125mL	S2-HG709270	09/22/2026	05/28/2022 / mohan	01/27/2022 / mohan	M5062
	10ug/mL					
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier  Absolute Standards, Inc.		Lot # 070622	I -	-		
Absolute	ItemCode / ItemName 57103 / Li, 10000 PPM,		Date	Opened By 01/30/2023 /	<b>Received By</b> 01/26/2023 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57058 / Cerium, 1000PPM, 100ML	020623	02/06/2026	03/06/2023 / bin	03/01/2023 / bin	M5467
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	082922	08/29/2025	04/14/2025 / jaswal	03/16/2023 / jaswal	M5470
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	082922	08/29/2025	04/14/2025 / jaswal	03/16/2023 / jaswal	M5471
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
PCI Scientific Supply, Inc.	26397-103 / PTFE BOILING STONES	W126678	03/20/2026	03/20/2025 /	06/12/2023 / jaswal	M5581
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier  Absolute Standards, Inc.	ItemCode / ItemName  58024 / Chromium, Cr, 500 ml, 1000 PPM	Lot # 060523	-	-		
Absolute	58024 / Chromium, Cr,		Date	Opened By 08/28/2023 /	Received By 08/25/2023 /	Lot #



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



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	051523	05/15/2026	02/06/2025 / kareem	01/03/2024 / jaswal	M5811
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	071123	07/11/2026	03/26/2024 / Sohil	01/03/2024 / jaswal	M5814
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	041723	04/17/2026	05/21/2024 / Jaswal	02/09/2024 / jaswal	M5815
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	122923	12/29/2026	05/20/2024 / Jaswal	02/09/2024 / jaswal	M5816
I						
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier  Absolute Standards, Inc.	ItemCode / ItemName  57116 / S, 10000 PPM, 125 ml	Lot # 071123	-	-		
Absolute	57116 / S, 10000 PPM,		Date	Opened By 03/01/2024 /	<b>Received By</b> 02/09/2024 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL	T2-MEB714417	01/27/2027	04/19/2024 / jaswal	02/22/2024 / jaswal	M5875
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	232820	08/31/2028	04/30/2024 / mohan	04/25/2024 / mohan	M5882
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000281938	07/06/2026	04/30/2024 / mohan	04/25/2024 / mohan	M5884
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic	CGTI1-1 / TITANIUM	T2-TI719972	06/17/2027	06/18/2024 /	02/22/2024 /	M5942
Ventures	125mL 1000ug/mL			Jaswal	Jaswal	WI0542
Ventures  Supplier	125mL 1000ug/mL  ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Jaswal Received Date / Received By	Chemtech Lot #
		Lot # V2-Y740548	•	Date Opened /	Received Date /	Chemtech
Supplier Inorganic	ItemCode / ItemName		Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	061224	06/21/2027	07/01/2024 / Jaswal	07/01/2024 / Jaswal	M5970
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	U2-IN729349	02/21/2028	10/08/2024 / Jaswal	06/14/2024 / Jaswal	M5985
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB727800	12/21/2027	02/03/2025 / JANVI	02/22/2024 / kareem	M5997
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorgania	MANALES 4 / Laboratory	T2-MEB723367	00/00/0000	04/15/2025 /	05/14/2024 /	MOOOF
Inorganic Ventures	WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml	12 MEB/2001	08/30/2026	JANVI	Jaswal	M6005
•	Fortified Stock Solution 1,	Lot #	Expiration Date			Chemtech
Ventures	Fortified Stock Solution 1, 125 ml		Expiration	JANVI  Date Opened /	Jaswal Received Date /	Chemtech
Supplier Inorganic	ItemCode / ItemName  WW-LFS-2 / Laboratory Fortified Stock Solution 2,	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By  05/14/2024 /	Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	0624724	06/27/2027	08/05/2024 / kareem	08/05/2024 / Jaswal	M6023
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	070124	07/01/2027	08/05/2024 / kareem	08/05/2024 / Jaswal	M6028
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	122823	12/28/2026	08/05/2024 / kareem	08/05/2024 / Jaswal	M6030
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	010924	01/09/2027	01/14/2025 / Jaswal	08/05/2024 / Jaswal	M6032
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	V2-MEB746173	01/29/2026	01/29/2025 / JANVI	08/22/2024 / Jaswal	M6058
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	V2-MEB746762	01/01/2026	01/01/2025 / kareem	09/19/2024 / kareem	M6076



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	V2-MEB746762	09/06/2029	01/23/2025 / kareem	09/19/2024 / kareem	M6077
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
PCI Scientific Supply, Inc.	1403 / Hydrogen Peroxide, 30% 1 gal	820803	05/25/2025	11/26/2024 / Eman	11/22/2024 / Eman	M6125
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	06/03/2025	12/03/2024 / Janvi	11/12/2024 / Janvi	M6126
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute	58112 / Mg, 10000 PPM,	112124	11/21/2027	01/13/2025 /	01/13/2025 /	M6127
Standards, Inc.	500 ml			kareem	kareem	1010127
Standards, Inc.  Supplier	ItemCode / ItemName	Lot #	Expiration Date		kareem  Received Date / Received By	Chemtech
		Lot # 101124	Expiration	kareem  Date Opened /	Received Date /	Chemtech
Supplier  Absolute	ItemCode / ItemName 58025 / Mn, 1000 PPM,		Expiration Date	Date Opened / Opened By 01/13/2025 /	Received Date / Received By	Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	121824	12/18/2027	04/17/2025 / Janvi	01/13/2025 / Jaswal	M6138
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	103024	10/30/2027	05/06/2025 / JANVI	01/13/2025 / Jaswal	M6142
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	072424	07/24/2027	01/23/2025 / kareem	01/13/2025 / Jaswal	M6144
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	121724	12/17/2027	02/04/2025 /	01/13/2025 / Jaswal	M6145
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	071724	07/17/2027	01/31/2025 / kareem	10/18/2024 / kareem	M6146
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV1-1014	07/07/2025	02/07/2025 / JANVI	04/20/2021 / JANVI	M6150



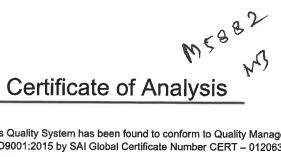
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22G2862015	08/18/2025	02/18/2025 / Sagar	01/15/2025 / Sagar	M6151
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	08/24/2025	02/24/2025 / kareem	04/20/2021 / kareem	M6152
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	ICSB-0710	06/20/2025	02/10/2025 / kareem	02/09/2024 / kareem	M6155
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Supplier Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	Lot # 24D1062002	1 -	-		
	BA-9598-34 / Nitric Acid,		Date	Opened By 03/10/2025 /	Received By 02/02/2025 /	Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	Date 03/25/2029 Expiration	Opened By  03/10/2025 / Eman  Date Opened /	Received By  02/02/2025 / Sagar  Received Date /	Lot # M6158  Chemtech
Seidler Chemical  Supplier  Absolute	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)  ItemCode / ItemName  58113 / AI, 10000 PPM,	24D1062002	Date 03/25/2029  Expiration Date	Opened By  03/10/2025 / Eman  Date Opened / Opened By  03/18/2025 /	Received By  02/02/2025 / Sagar  Received Date / Received By  02/09/2025 /	Lot # M6158  Chemtech Lot #



Fax: 908 789 8922

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	DIW / DI Water	Daily Lab-Certified	07/03/2029	07/03/2024 / lwona	07/03/2024 / lwona	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, DIHYDR	ATE CERTIFIED ACS (Suitable for Me	rcury 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 sta processing aids, or any other mater	arting raw material ingredients, or used rial that might migrate to the finished pr	in processing, including lubricants, oduct.

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

## Certified Reference Material CRM

M6032

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

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

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

Nitric Acid

Formulated By:

Giovanni Esposito

010924

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

Lot Nominal SDS Information

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

Purity Uncertainty Assay Target Actual Actual Uncertainty

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

010924

orl-rat 355 mg/kg 3104a

[1] Spectrum No.1

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

Part # 57056



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

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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).

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

**Expiration Date:** 

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

**SDS Information** 

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

**NIST** SRM

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

1 of 2

www.absolutestandards.com

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).

Part # 57048

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### Certificate of Analysis

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CLPP-CAL-1

Lot Number: T2-MEB714417

Matrix: 5% (v/v) HNO3

Value / Analyte(s): 5 000 µg/mL ea:

Calcium, Potassium, Magnesium, Sodium,

2 000 µg/mL ea:

Aluminum, Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese, 250 μg/mL ea:

Silver, Copper,

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

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

**Density:** 1.118 g/mL (measured at  $20 \pm 4$  °C)

### **Assay Information:**

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

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

### Characterization of CRM/RM by Two or More Methods 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 (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ 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 $\mathbf{u_{char}} = [\Sigma((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)]^{1/2}$ 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="https://www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

January 27, 2022

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

20178Ci

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

www.absolutestandards.com



Certified Reference Material CRM

M5810 M5811

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: Description:

58126 051523 Iron (Fe)

R: 01/03/24

Solvent: 21110221 Lot # Nitric Acid

Formulated By:

J. Brans

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5.0%

250.0 

Nitric Acid

Giovanni Esposito

051523

Reviewed By:

Pedro L. Rentas

051523

Purity Uncertainty Assay 0.12 Flask Uncertainty Expanded SDS Information

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

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

1. Iron (Fe)

Compound

RM#

Number E E

Conc. (µg/mL)

36

Purity (%)

8

Nominal

Nominal Concentration (µg/mL):

NIST Test Number:

**BTUB** 10000

5E-05 Balance Uncertainty

Recommended Storage:

Ambient (20 °C) 051526

**Expiration Date:** 

Weight shown below was diluted to (mL):

5000.1

Uncertainty

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

LD50

SRM

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

70 BO 90

100

m/2->

10

20

30

40

S O

60

1.054

2.0E4

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

1.0E8

200

m/z->

110

120

130

5.0E7

1.0E8-

5.0E7

230 240

250

260

1 of 2

Lot # 051523

T/2->

210

220

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

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

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(I) = larger analyte

### Physical Characterization:

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

Certified by:

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

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

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

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



### Certificate of Analysis

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

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-1

Lot Number:

T2-MEB723367

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

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

Iron,

200 μg/mL ea:

Sodium,

Magnesium, Aluminum, Cerium, Selenium,

Thallium,

100 μg/mL ea:

Lead, Calcium,

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

40 μg/mL ea: Chromium,

30 μg/mL ea:

Copper, Boron,

Vanadium,

20 μg/mL ea:

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

7.5 µg/mL ea: Silver

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

**Assay Information:** 

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

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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:

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certified Value, X<sub>CRMRM</sub>, where one method of characterization is used is the mean of individual results:

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

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

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

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

N/A

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

August 30, 2022

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

<ul> <li>Sealed TCT Bag Open Date</li> </ul>	
--	--

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

**Paul Gaines** 

Chairman / Senior Technical Director

DD978hi.



### Certificate of Analysis

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

### 1.0 **ACCREDITATION / REGISTRATION**

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

WW-LFS-2

Lot Number:

U2-MEB731108

Matrix:

5% (v/v) HNO3

tr. HF

Value / Analyte(s):

200 µg/mL ea:

Silica,

80 µg/mL ea: Antimony, 70 µg/mL ea:

Tin,

40 µg/mL ea: Molybdenum, 20 µg/mL ea:

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

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

Titanium

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

Silica, SIQ2

200.2 ± 1.3 μg/mL

Tin, Sn

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

Titanium, Ti

20.01 ± 0.13 µg/mL

Density:

1.025 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = 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:

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

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

u<sub>char a</sub> = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/Δ

### 6.0 INTENDED USE

- 6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.
- **6.2** For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale.</u> <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 HF Note: This standard should not be prepared or stored in glass.

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

### 11.1 Certification Issue Date

March 17, 2023

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

### 11.2 Lot Expiration Date

- March 17, 2028
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

<ul> <li>Sealed TCT Bag Open Date</li> </ul>	
--	--

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control 3D978hi.

**Certifying Officer:** 

Paul Gaines
Chairman / Senior Technical I

Chairman / Senior Technical Director

### 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,

Specification	Result
>= 96.0 %	99.1
Passes Test	PT
<= 0.050 %	0.017
<= 0.25	0.19
Passes Test	PT
<= 0.005 %	< 0.003
<= 5 ppm	4
<= 5 ppm	< 3
<= 0.050 ppm	< 0.005
	>= 96.0 % Passes Test <= 0.050 % <= 0.25 Passes Test <= 0.005 % <= 5 ppm <= 5 ppm

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

WAZY DX.



### Manufacturer:

Saint-Gobain Performance Plastics 11 Sicho Drive Poestenkill, NY 12140

### **Certificate of Conformance**

Part Number		Customer Part Number/ Revision:	1069103 N/A
Description:	*PTFE BOILING STONES-450 GRA	AMS	
Lot Number:	26275770	Lot Quantity:	10 EA
Date of Manufacture (MM/DD/YY)	03/23/20	Expiration Date: (MM/DD/YY)	N/A
(Refer to th	Post Processing Run Number: ne attached Certificate for Additional Detail)		N/A

### We certify the material listed above confirms in full with the following specifications:

All items have been manufactured, inspected, tested, and accepted in accordance with our Quality Management system, ISO 9001-2015. Documentation substantiating this certification is kept on record per the Company's retention policy and is available for review.

All materials and processes used in manufacturing conform to the materials and/or manufacturing specifications and notes indicated on the purchase order, drawing, specifications, quality assurance requirements, or other applicable documents effective on the date of manufacture.

Saint-Gobain does not warrant the product for any particular application and it is the responsibility of the user to conduct tests that are deemed necessary to determine the suitability of the product for any particular use. Saint-Gobain's sole responsibility shall be for failure to manufacture the product in accordance with specifications and requirements of the buyer, and from defects in material and workmanship. This warranty is expressly made in lieu of any and all other warranties and Saint-Gobain's sole liability shall be to replace any product not in conformance with the specification and requirements of the buyer.

Quality Approval:	goodla Kondla	Date:	05/13/20	
	,			



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

uchar a = 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
                                   M Pb <
                    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 <
                                              0.000201 M V <
                                                               0.000201
M
  Cu <
          0.000402 O
                    Mg
                            0.000001 O
                                      S <
                                             0.053950 M W <
                                                               0.000604
M Dy <
          0.000201 M Mn <
                            0.000604 M Sb <
                                             0.001208 M Y <
                                                               0.000201
M Er <
          0.000201 M Mo
                           0.000009 M Sc <
                                             0.000201 M Yb <
                                                               0.000201
```

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

### 11.1 Certification Issue Date

September 22, 2021

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

Sealed TCT	Bag	Open Date	:		

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

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

Uyen Truong
Supervisor, Product Documentation

Mya Truong

### Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Booth

### Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Laines

Certified Deference Metaric Com

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

<u>ئ</u>

Certified Reference Material CRM
[N 403 | 20 | 128 | 125 | 1

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

070622 070622 Pedro L. Rentas Lawrence Barry Formulated By: Reviewed By: Nitric Acid Nitric Acid 20510011 Fot # 20.0 (mL) Solvent: 2% 0.058 Flask Uncertainty 5E-05 Balance Uncertainty 1000.12 Ambient (20 °C) Lithium (Li) Weight shown below was diluted to (mL): 57103 070622 070625 10000 **6UTB** Nominal Concentration (µg/mL): NIST Test Number: Lot Number: Description: Expiration Date: Recommended Storage: Part Number: CERTIFIED WEIGHT REPORT:

Γ						ar]	[ 9.619 sec]:58103.D# [Count] [Linear]	# [C	58103.D	sec]::	_	No.1	ctrum	[1] Spectrum No.1	
5	Byfill 0241 ischin	2					1000								
MA	0.10 10.0 100.0134 100.0173 10000.4 20.0 7790-69-4 5 ma/m3 nd-sat 1428 ma/m NA	5 ma/m3	7790-69-4	20.0	10000.4	100.0173	100.0134	10.0	0.10	99.999	10000 89.889 0.	IN019 UZ042018A1	IN019		Lithium nitrate (Li)
SEM	LD50	RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50	CAS#	+/- (ug/mL)	Conc. (ug/mL)	Weight (g)	Weight (g)	(%)	Purity (%)	(%)	Conc. (µg/mL)	Number	RM#		БПроппа
	Attached oc.)	(Solvent Safety Info. On Attached og.)	(Solv	Uncertainty	Actual	Actual	Target	Assay	Nominal Punty Uncertainty Assay. Target	Funty	Nominal	707			Commonia
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1.056	6.0E5	m/z->- 500 250	7,2-7 20 10	m/z->
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9.619 sec]:58103.D# [Count] [Linear]		.0	130	OR A
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## Certified Reference Material CRM



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

							Trace Me	stale	Varifics	tion	hy ICP.	MC	( lm/m/)						
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B.	<b>40.02</b>	රි	<b>40.02</b>	පී	<b>20.0</b> 2	3	<0.02	₩ W	<b>40.02</b>	Æ	<0.02	SB	<0.02	S	<0.05	5	8	- E	200
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Physical Characterization:

(T)= Target analyte

Certified by:

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

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

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

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

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

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

Part # 57103

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Certified Reference Material CRM



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NIST SRM

Z

CERTIFIED WEIGHT REPORT 1. Cerium nitrate hexahydrate (Ce) Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: m/z-> m/z-> m/z-> 2,5E7-5.0E7 1.0E6-2.0E6-5.0EB-NIST Test Number: Expiration Date: Part Number: Description: Lot Number: [1] Spectrum No.1 [ 43.472 sec]:58158.D# [Count] [Linear] 210 10 5 IN146 Z512CEB1 24 061322 Cerlum (Ce) 000 061325 57058 Ambient (20 °C) Number 헏 220 120 20 Conc. (ug/mL) 1000.12 Nominal 9 230 130 30 99.999 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity 3 Uncertainty Assay Purity (%) 0.10 240 140 6 Solvent 22 3 8 20510011 3.04919 Weight (g) Target 250 S O [0] # 150 20.0 (mL) 3.04923 Nitric Acid Weight (g) Conc. (µg/mL) Nitric Acid Actual 260 160 60 1000.0 Actual 170 70 -/- (µg/m) Reviewed By: Formulated By: Uncertainty Expanded 20 10294-41-4 180 8 (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Lawrence Barry OSHA PEL (TWA) SDS information 190 90 ₹ 200 100 **LD50** ₹ 061322 061322

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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11	Sn	Tm	3	ᄇ	Te	41			
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Zr	Zn	Y	4	<	c	W			
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(T)= Target analyte

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

Physical Characterization:

- \* 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 # 57058

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



## Certified Reference Material CRM

R: 03/01/23(12)



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

Solvent: 2110221 Nitric Acid   Permulated By: Lawrence Barry   D20623   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry   D20623   Cerlum (Co)   1000   Current (20 °C)   1000	Ce)   Solvent: 2110221 Nitric Acid   Formulated By: Lawrence Barry   O20623   (mL)   (mL)
Solvent: 2110221 Nitric Acid   Permulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)   2% 20.0 Nitric Acid   Pormulated By: Lawrence Barry   020623   1000   6UTB   5E-05 Baiance Uncertainty   6UTB   Select Select Control   1000   Color   1000
Solvent: 21110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)   2% 20.0 Nitric Acid   Pormulated By: Lawrence Barry   020623   1000   6UTB   5E-05 Baiarno Uncertainty   5E-05 Baiarno Uncertainty   Actual   Actual
Solvent: 21110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)	Lot #
Solvent: 2110221 Nitric Acid   Permulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)   2% 20.0 Nitric Acid   Pormulated By: Lawrence Barry   020623   1000   6UTB   5E-05 Baiance Uncertainty   6UTB   Select Select Control   1000   Color   1000
Solvent: 2110221 Nitric Acid   Formulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)
Solvent: 2110221 Nitric Acid   Formulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)
Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Portun (20°C)   1000   5E-05 Balance Uncertainty   1000.12 0.056 Flesk Unce
Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry (mL)   1000   5E-05 Balance Uncertainty   Expanded   SDS Information   Expanded   SDS Information	Lot #   Lot #
57058         Solvent:         2110221         Nitric Acid         Permulated By:         Lawrence Barry           020623         20.0         Nitric Acid         Pormulated By:         Lawrence Barry           020826         Ambient (20 °C)         (mL)         Pedro L. Rentas           1000         6UTB         5E-05 Balance Uncertainty         Pedro L. Rentas           ediluted to (mL):         1000.12         0.058 Plask Uncertainty         Expanded         SDS Information	57058         Solvent:         2110221         Nitric Acid         Permulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Expanded         SDS Information
57058         Solvent:         2110221         Nitric Acid           020623         2%         20.0         Nitric Acid           020626         Ambient (20 °C)         (mL)         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Reviewed By:         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Expanded         SDS Information	Lot #
57058         Solvent:         2110221         Nitric Acid           Certum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Reviewed By:         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas           6UTB         50.058 Plask Uncertainty         SDS Information	Lot #
57058         Solvent:         2110221         Nitric Acid           020623         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Formulated By:         Lawrence Barry           4 mbient (20 °C)         (mL)         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         Fedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Fedro L. Rentas	Lot #   Lot
57058         Solvent:         2110221         Nitric Acid           020623         20-110221         Nitric Acid         Pormulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Pedro L Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L Rentas         Pedro L Rentas	Lot #   Lot   Lot
57058         Solvent:         2110221         Nitric Acid         Pormulated By:         Lawrence Barry           020623         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Reviewed By:         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas	Lot #
57058         Solvent:         2110221         Nitric Acid         Pedro L. Rentas           020623         20.00         Nitric Acid         Pedro L. Rentas           020626         Ambient (20 °C)         (mL)         Pedro L. Rentas           4 Illuted to (mL):         1000.12         0.058 Pleast Uncertainty         Pedro L. Rentas	Lot #   Lot #
57058         Solvent:         2110221         Nitric Acid         Pedro L. Rentas           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         1000         (mL)         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas           6UTB         1000.12         0.058 Plask Uncertainty         Reviewed By:         Pedro L. Rentas	Lot #
57058         Solvent:         2110221         Nitric Acid           020623         20-110221         Nitric Acid         Pormulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Pedro L. Rentas           4 O0012         5E-05 Balance Uncertainty         Pedro L. Rentas         Pedro L. Rentas	Solvent: 2110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000   6UTB   5E-05 Batance Uncertainty   edituted to (mL): 1000.12 0.058   Pask Unce
57058         Solvent:         2110221         Nitric Acid           020623         20-110221         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Mitric Acid         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas         Pedro L. Rentas	Lot #   Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000   6UTB   5E-05 Balance Uncertainty   GUTB   SE-05 Balance Uncertainty   GUTB   GUT
Solvent: 2110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000   6UTB   5E-05 Balance Uncertainty   Illusted to (mL)   1000   100	Lot #   Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000   6UTB   5E-05 Balance Uncertainty   GUTB   SE-05 Balance Uncertainty   GUTB
Solvent: 2110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Multiple (20 °C)   1000   6UTB   5E-05 Balance Uncertainty   Reviewed By: Pedro L. Rentas   Pedro L. Ren	Lot #   Lot #
57058         Solvent:         2110221         Nitric Acid         Permulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Nitric Acid         Formulated By:         Lawrence Barry           4 mbient (20 °C)         1000         6UTB         SE-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas	Lot #
57058         Solvent:         21110221         Nitric Acid         Permulated By:         Lawrence Barry           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Mind Acid         Mind Acid         Mind Acid           6UTB         5E-05 Balance Uncertainty         Pedro L. Rentas         Reviewed By:         Pedro L. Rentas	Lot #
57058         Solvent:         2110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Mitric Acid         Formulated By:         Lawrence Barry           4 mbient (20 °C)         1000         6UTB         SE-05 Balance Uncertainty         Pedro L. Rentas	Lot #   Lot #   Lot #   Solvent: 21110221   Nitric Acid   Certum (Ce)   2% 20.0   Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000   SE-05 Balance Uncertainty   SE-05 Balance Uncertainty   Reviewed By: Pedro L. Rentas
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         4mbient (20 °C)         (mL)         Mitric Acid         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Bentas	57058         Solvent:         21110221         Nitric Acid         Pormulated By:         Lawrence Barry           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Manient (20 °C)         Manient (20 °C)           1000         6UTB         5E-05 Balance Uncertainty         Pedro L. Berrias
57058         Solvent:         2110221         Nitric Acid           020623         200         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Ambient (20 °C)         Mind (20 °C)           1000         6UTB         5E-05 Balance Uncertainty         Barrier         Barrier	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000   5E-05 Balance Uncertainty   Barriage   By: Pacing Barry   Barry   Barriage   By: Pacing Barry   Barriage   By: Pacing Barry   Barriage   By: Pacing Barry   Barriage   By: Pacing Barry   By: Pacing
57058         Solvent:         2110221         Nitric Acid           020623         200         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Mitric Acid         Formulated By:         Lawrence Barry           4 mbient (20 °C)         1000         5E-05 Balance Uncertainty         Bodiest Britishing	57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Ambient (20 °C)         Mind Acid         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         5E-05 Balance Uncertainty         Bodies I Declaration         Bodies I Declaration
57058         Solvent:         2110221         Nitric Acid           020623         2%         20.0         Nitric Acid           020626         Ambient (20 °C)         (mL)         Formulated By:         Lawrence Barry           4 mbient (20 °C)         1000         1000         1000         1000	57058 Solvent: 21110221 Nitric Acid Certum (Ce)  2% 20.0 Nitric Acid Ambient (20 °C) 1000 6UTB  5F-05 Release Investments
57058         Solvent:         21110221         Nitric Acid           Certum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         4mbient (20 °C)         1000         1000         1000	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000   1000   EF OF THE CENTRAL   C
57058         Solvent:         21110221         Nitric Acid           Cerium (Ce)         2% 20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         1000         Marchian (20 °C)         Marchian (20	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         4mbient (20 °C)         Manual Acid         Manual Acid <td< td=""><td>  Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000</td></td<>	Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         4mbient (20 °C)         Mandient (20 °C)         Mandient (20 °C)         Mandient (20 °C)	57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         (mL)         (mL)         Ambient (20 °C)         Manual control of the control o
57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C) </td <td>57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         X         X         X</td>	57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         X         X         X
57058         Solvent:         21110221         Nitric Acid         Permulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C) <td>57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         ************************************</td>	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         ************************************
57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         ************************************	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000
57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Manual Control	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Manual Control C
57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Mandient (20 °C)         (mL)	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   Minus (mL)
Solvent: 2110221 Nitric Acid   Solvent: 21110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   (mL)   Formulated By: Lawrence Barry (mL)   Formulated By: Lawrence By: Lawren	Lot #   Lot #
57058         Solvent:         2110221         Nitric Acid           020623         2%         20.0         Nitric Acid           Ambient (20 °C)         (mL)         Formulated By:         Lawrence Barry	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         Control of the contro
57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid           020626         (mL)         Formulated By:         Lawrence Barry	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)
57058         Solvent:         21110221         Nitric Acid           Certum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   Ambient (20 °C)   Ambient (20 °C)   Converse   Co
Solvent: 2110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry   Ambient (20 °C)   Ambient (20 °C)   Ambient (20 °C)   Control of the c	57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)	57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20°C)         Ambient (20°C)         Ambient (20°C)         Ambient (20°C)         Ambient (20°C)
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Ambient (20 °C)         (mL)	Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry Ambient (20 °C)   Ambient (20 °C)   Ambient (20 °C)   Cerlum (Ce)   Ce
57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20.00)	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)
Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry   Ambise (20.0)   (mL)   Ambise (20.0)   (mL)   Cerlum (Ce)   Cerlum (	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)
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57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)	Lot #   Lot #   Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)
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Compound	RM#	Lot	Nominal Conc. (vg/mL)	Purity (%)	Purity Uncertainty Assay (%) Purity (%) (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Actual Uncertainty Weight (g) Conc. (ug/mt.) +/- (ug/mt.)	Uncertainty +/- (ug/mL)	SS	(Solvent Safety Info. On Attached pg.) CAS# OSHA PEL (TWA) LD50	ched pg.) LD50	NIST
Cerium nitrate hexahydrate (Ce)	IN146	IN146 Z512CEB1	1000	88.98	0.10	32.8	3.04919	3.04921 1000.0	1000.0	20	II ==	¥.	<b>4</b> 2	ĄN
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## Certified Reference Material CRM





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

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

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Physical Characterization:

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

(T)= Target analyte

My J. M.

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 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.

<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).



### MATERIAL CERTIFICATE OF COMPLIANCE

**DATE: JUNE 12, 2023** 

**CUSTOMER:** 

PCI SCIENTIFIC SUPPLY, INC

**PURCHASE ORDER NO.** 

6054931

CATALOG NO.

BOI5021-450L

PRODUCT DESCRIPTION:

**BOILING STONES, TFE, 454GMS** 

**QUANTITY:** 

10 EACH

LOT NO.

W126678

**SPECIFICATION (S):** 

Made from Virgin PTFE Resin

We certify that we have complied with the terms and conditions of the above Purchase Order and the Part Specifications in the manufacturing of the above product.

Laura Valencia

**Quality Assurance Inspector** 

F:U:J:CF:PCISCI:GOC-55118-BQI5021-061223

## 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

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Part # 58024



## 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:

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

the preparation of all standards.

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

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

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

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

www.absolutestandards.com



Certified Reference Material CRM MSTHT

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

CERTIFIED WEIGHT REPORT: Part Number: R: 12/20/23 Lot #

Nitric Acid

Solvent: 24002546

2%

Nitric Acid

Formulated By:

Lawrence Barry

100923

60.0

**Lot Number:** Description: 57082 100923 Lead (Pb)

**Expiration Date:** 100926

Recommended Storage: **NIST Test Number:** BIN9 1000 Ambient (20 °C)

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

Cot

Nominal

Purity

Uncertainty Assay

|--|--|--|

Target Weight (a) Con Actual Actual Uncertainty +/- (ua/mL) Expanded #SAC SDS Information
(Solvent Safety Info. On Attached pg.)
(SONA PEL (TWA) TSIN

Pedro L. Rentas

100923

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Part # 57082

www.absolutestandards.com



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## Physical Characterization:

(1)= Target analyte

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

Certified by:

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

the preparation of all standards.

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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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800-368-1131

Absolute Standards, Inc.

## 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 Kandard.

Certified by:

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

the preparation of all standards.

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

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CERTIFIED WEIGHT REPORT



Certified Reference Material CRM

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R:8/25) Lot # Solvent:

21110221

Nitric Acid

Part Number: Description: Lot Number: 58029 071723 Copper (Cu)

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

(mL)

40.0

Nitric Acid

Formulated By:

Benson Chan

071723

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): **NIST Test Number:** 1000 **BTU9** 2000.02 0.058 5E-05 Flask Uncertainty Balance Uncertainty Reviewed By: Pedro L. Rentas

Part

Lot

Dilution

Initia

Uncertainty

Nominal

Initial

 Copper(II) nitrate trihydrate (Cu) 58129 022723 0.1000 200.0 0.084 1000 10000.5 1000.0 2.2 10031-43-3 1 mg/m3 ori-rat 794 mg/kg

Number Number Factor Val. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LDSO 3114 SRM

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

071723

5.0E5 1.0E6 [1] Spectrum No.1 [ 33.422 sec]:58029.D# [Count] [Linear]

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:

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 the preparation of all standards.

<sup>\*</sup> All standard containers are meticulously cleaned prior to use.
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## Certified Reference Material CRM



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

24002546 Nitric Acid

2.0% (IE)

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		Section and		SOMETHINGS.	NAME OF STREET	SAMOOGE STATE	SECOND SPINSO	None and a	. 18						
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(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. Ammortium hexafluorostannate(IV) (Sn) m/z-> ---x/m --Z/111 2.5E4 5.0E4 1.0ES 2.0E6 2.5E5 S.OEG [1] Spectrum No.1 210 110 0 IN010 SND042023A1 120 220 N [ 15.034 sec]:58150.D# [Count] [Linear] 1000 230 130 8 240 140 0.10 40 44.2 250 150 Ö 1.13107 1.13286 160 260 60 1001.6 170 70 2.0 180 80 16919-24-7 190 90 7 mg/m3 200 100 ₹ 3161a

Part # 57050

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

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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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\* 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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R: 02109124





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

						TANK BURNE	10000	CHICAGO CONTROL CONTRO	URCH LABILLY	ianioc)	(Solvent Safety Into, On Attached pg.)	rttached pg.)	202
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL) C	conc. (ug/ml.)	Conc. (µg/mL)	Conc. (ug/ml.)	+/- (ng/mL)	CAS#	Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)	1050	SRM
Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0	58127	050923	0.1000		0.084	1000	10000	100001 100001	9.0	10008.000	000	700	
							20000		7:5	100c0-22-9	O.UZ ING/ITI3	STEE 10020-22-9 0.02 mg/ms on-rat 691 mg/kg 3113	3113
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		100		200	

Lot # 091923

250

240

230

220

010

W/Z->

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

							Trace M	etals	Verifical	tion	by ICP-M	4S (F	ig/mL)						
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(T)= Target analyte

### Physical Characterization:

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



<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.



Lot # 091923

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## Certified Reference Material CRM

M5801



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CERTIFIED WEIGHT REPORT: 1. Arsenic (As) Compound Nominal Concentration (µg/mL): M/2-> m/z-> -z/m 5.OE4 2.5E4 Recommended Storage: 1.0E5 2.0日5 1000 Volume shown below was diluted to (mL): 500 **NIST Test Number: Expiration Date:** Part Number: Description: Lot Number: [1] Spectrum No.1 210 110 0 58133 Number Part **SUTB** 1000 111326 57033 111323 Ambient (20 °C) Arsenic (As) 020522 Number 120 D D ONN NO [ 34.433 sec]:57033.D# [Count] [Linear] 0.1000 4000.0 Dilution Factor 230 130 30 Vol. (mL) 5E-05 400.0 initial 0.06 Pipette (mL) Conc. (µg/mL) Flask Uncertainty Balance Uncertainty Uncertainty 240 140 40 0.084 24002546 Nominal 2.0% Lot # 100 250 160 50 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid 10001.0 Solvent: Initial 80.0 260 160 60 Nitric Acid 1000.0 Fina 170 0 Formulated By: Reviewed By: +/- (µg/ml.) Uncertainty Expanded 2.0 180 Thomas 80 7440-38-2 (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) Pedro L. Rentas Lawrence Barry 90 SDS Information 0.5 mg/m3 100 000 orl-rat 500 mg/kg LD50 111323 111323 3103a NIST SRM

Printed: 2/8/2024, 5:01:04 PM

## 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
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Part # 57033

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## Certified Reference Material CRM

Solvent: MKBQ8597V Ammonium hydroxide

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

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

Part Number: Lot Number: 57005 071123

Description: Boron (B)

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

**Expiration Date:** 

071126

2.0%

Ammonium hydroxide

Formulated By:

Benson Chan

071123

tento

40.0

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

RM#

Number

Purity (%)

3

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

071123

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

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

NIST SRM

Weight (g) Conc. (µg/mL)

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

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

180

190

200

80

90

100

Part # 57005

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

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

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

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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).

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

www.absolutestandards.com



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

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

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(I)= larget analyte

## Physical Characterization:

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

Certified by:

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

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

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

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

2 of 2

Part # 57115

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www.absolutestandards.com



### R1 02/09/124 Certified Reference Material CRM

M5816

CERTIFIED WEIGHT REPORT

Part Number:

Lot Number: Description:

57016 122923

Solvent:

122923

**ASTM Type 1 Water** 

Lot #

**Expiration Date:** 122926 Sulfur (S)

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

Recommended Storage:

Ambient (20 °C)

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

Nominal

Purity

Uncertainty Assay

Target

Actual

Uncertainty

Expanded

Reviewed By:

Pedro L. Rentas

122923

tento

Formulated By:

Benson Chan

122923

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

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

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

Part # 57016

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

(I) = larget analyte

## **Physical Characterization:**

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

Certified by:

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

the preparation of all standards.

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

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

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

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

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

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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		

Part # 57116

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

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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).

Part # 57116

Absolute Standards, Inc. 800-368-1131

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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Lot #

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

Formulated By:

Lawrence Barry

091123

Pedro L. Rentas

091123

**SDS** information

rento

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

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

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

Part # 57015

--z/m

210

220

230

240

250

260



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

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

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

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







Material No.: 3624-01

Batch No.: 0000281938

Manufactured Date: 2021-06-07

Retest Date: 2026-06-07

Revision No.: 1

### Certificate of Analysis

Test	Specification	Result
Assay (NaCl) (by Ag titrn)	≥ 99.0 %	100.0 %
pH of 5% Solution at 25°C	5.0 - 9.0	6.3
Insoluble Matter	≤ 0.005 %	0.003 %
lodide (I)	≤ 0.002 %	< 0.002 %
Bromide (Br)	≤ 0.01 %	< 0.01 %
Chlorate and Nitrate (as NO <sub>3</sub> )	≤ 0.003 %	< 0.001 %
ACS - Phosphate (PO <sub>4</sub> )	≤ 5 ppm	< 5 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.004 %	< 0.004 %
Barium (Ba)	Passes Test	Passes Test
ACS - Heavy Metals (as Pb)	≤ 5 ppm	< 5 ppm
ron (Fe)	≤ 2 ppm	< 1 ppm
Calcium (Ca)	≤ 0.002 %	< 0.001 %
Magnesium (Mg)	≤ 0.001 %	< 0.001 %
Potassium (K)	≤ 0.005 %	0.001 %

For Laboratory, Research, or Manufacturing Use Meets Reagent Specifications for testing USP/NF monographs Country of Origin: USA

Packaging Site: Paris Mfg Ctr & DC





Certificate of Analysis

R: 02/22/24 M.5942

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

### 1.0 **ACCREDITATION / REGISTRATION**

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Single Analyte Custom Grade Solution

Catalog Number:

CGTI1

Lot Number:

T2-TI719972

Matrix:

2% (v/v) HNO3

tr. HF

Value / Analyte(s):

1 000 µg/mL ea:

Titanium

Starting Material:

Ti Metal

Starting Material Lot#:

2094

Starting Material Purity: 99.9975%

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

**Certified Value:** 

 $1002 \pm 5 \mu g/mL$ 

Density:

1.012 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

Assay Method #1

1002 ± 4 µg/mL

ICP Assay NIST SRM 3162a Lot Number: 130925

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

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

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

Certified Value, X<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  $u_{char}$  i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certified Value, X<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>n</sub> = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

	M	Ag	<	0.000536	М	Eu	<	0.000268	0	Na	<	0.032670	M	Se		0.001204	0	Zn	<	0.003267
	0	Αl		0.000872	0	Fe		0.003225	0	Nb	<	0.043560	0	Si		0.004735	0	Zr	<	0.043560
	М	As	<	0.008586	M	Ga	<	0.000268	M	Nd	<	0.000268	M	Sm	<	0.000268				
	М	Au	<	0.004577	M	Gd	<	0.000268	0	Ni	<	0.010890	M	Sn		0.000096				
	0	В	<	0.008929	M	Ge	<	0.002146	M	Os	<	0.000269	0	Sr		0.000096				
	М	Ba	<	0.002683	M	Hf		0.002161	0	P	<	0.054450	M	Ta		0.010560				
	M	Ве	<	0.005366	М	Hg	<	0.003231	M	Pb	<	0.001073	M	Tb	<	0.000268				
	M	Bi	<	0.001609	M	Но	<	0.000268	М	Pd	<	0.000268	M	Te	<	0.001341				
	0	Ca		0.000676	M	In	<	0.002683	M	Pr	<	0.000268	M	Th	<	0.053663				
	M	Cd	<	0.000268	М	lr -	<	0.000269	M	Pt	<	0.000536	s	Ti	<					
	М	Ce	<	0.000268	M	K		0.001172	M	Rb	<	0.000268	M	TI	<	0.000268				
	М	Co	<	0.004293	М	Lа	<	0.000268	M	Re	<	0.000268	M	Tm	<	0.000268				
	M	Cr		0.000752	0	Li	<	0.027225	M	Rh	<	0.000268	M	U	<	0.000268				
	М	Cs	<	0.000268	М	Lu	<	0.000268	M	Ru	<	0.000269	M	V	<	0.019855				
-	0	Cu	<	0.010890	0	Mg	<	0.005445	i	S	<		M	W		0.000473				
	М	Dy	<	0.000268	0	Mn	<	0.003267	M:	Sb	<	0.006976	M	Υ	<	0.002146				
	М	Er	<	0.000268	M	Мо		0.000774	0	Sc	<	0.004900	M	Yb	<	0.000536				

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  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 - 47.87 +4 6 Ti(F)6-2 Chemical Compatibility - Soluble in concentrated HCl, HF, H3PO4 H2SO4 and HNO3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF.

**Stability** - 2-100 ppb levels stable (Alone or mixed with all other metals) as the Ti(F)6-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the Ti(F)6-2 chemically stable for years in 2-5% HNO3 / trace HF in an LDPE container.

**Ti Containing Samples (Preparation and Solution) -** Metal (Soluble in H2O / HF caution -powder reacts violently); Oxide - low temperature history anatase or rutile (Dissolved by heating in 1:1:1 H2O / HF / H2SO4); Oxide - high temperature history (~800EC) brookite (fuse in Pt0 with K2S2O7); Ores (fuse in Pt0 with KF + K2S2O7 - no KF if silica not present); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve by heating with 1:1:1 H2O / HF / H2SO4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite crystalline form).

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

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 48 amu	14 ppt	N/A	32S16O, 32S14N,
			14N16O18O,
			14N17N2, 36Ar12C,
			48Ca, [96X=2
			(where X = Zr, Mo,
			Ru)]
ICP-OES 323.452 nm	0.0054 / 0.00092 µg/mL	1	Ce, Ar, Ni
ICP-OES 334.941 nm	0.0038 / 0.000028 µg/mL	1	Nb, Ta, Cr, U
ICP-OES 336.121 nm	0.0053 / 0.000034 µg/mL	1	W, Mo, Co

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02 Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

### CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

### 11.1 Certification Issue Date

June 17, 2022

11.0

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

### 11.2 Lot Expiration Date

- June 17, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

2009784.

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director



### 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

### **ACCREDITATION / REGISTRATION** 1.0

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGY10

Lot Number:

V2-Y740548

Matrix:

2% (v/v) HNO3

Value / Analyte(s):

10 000 µg/mL ea:

Yttrium

Starting Material:

Yttrium Oxide

Starting Material Lot#:

2661 and 06230520YL

Starting Material Purity:

99.9984%

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

**Certified Value:** 

 $10000 \pm 30 \mu g/mL$ 

Density:

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

### **Assay Information:**

Assay Method #1

10011 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #2

9997 ± 50 µg/mL

ICP Assay NIST SRM 3167a Lot Number: 190730

Assay Method #3

9984 ± 31 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

Certified Value, X<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 uchar i

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

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

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

k = coverage factor = 2

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

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

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

uts = transport stability standard uncertainty

### - ------

Characterization of CRM/RM by One Method
Gertified Value, Xanuary, where one method of characterizat

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

XCDM/DM = (Xa) (Uchar a)

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

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) =  $U_{CRM/RM} = k (u^2_{char} a + u^2_{bb} + u^2_{lts} + u^2_{ts})^{V_2}$ 

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

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)

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

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

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

### 6.0 INTENDED USE

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

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

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.91 +3 6 Y(OH)(H2O)x+2 Chemical Compatibility -Soluble in HCl, H2SO4 and HNO3. Avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.

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

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H2O/ HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCl or HNO3).

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

February 20, 2024

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

_	Sealed TCT	Bag	Open	Date:	

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

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

**Uyen Truong Custom Processing Supervisor** 

Mayyand Man Paul R. Laine

### Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director

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



## Certified Reference Material CRM

M5962 R! 06/14/24



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

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

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

							I race M	1etals	Verifica	lion	oy ICP-M	S (1)	g/mL)						
Al	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	н	<0.02	Į.	<0.02	₽	<0.02	Re	<0.02	S:	<0.02	Te	<0.02	U	<0.02
As	<0.2	ಕಿ	<0.02	핃	<0.02	Ħ	<0.02	Mg	<0.01	°	<0.02	Rh	40.02	Ag	<0.02	∄	40.02	۷	<0.02
Ва	<0.02	င္တ	<0.02	æ	<0.02	ŀ	<0.02	Mn	<0.02	Pd	40.02	₽.	<0.02	Na	<0.2	Ħ	<0.02	ታ	<0.02
Ве	40.01	ť	40.02	Ga	<0.02	F	<0.2	Hg	A02	P	<0.02	Ru	40.02	Sr	<0.02	Tm	<0.02	¥	<0.02
Bi	40.02	င္ပ	<0.02	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	Рь	<0.02	M	<0.02	×	40.2	Sc	<0.02	Ta	<0.02	Ħ	<0.02	Z	<0.02

(T) = Target analyte

## Physical Characterization:

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

Certified by:

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

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

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

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

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

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

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

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

**\$** 

Certified Reference Material CRM

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

Part # 57003 Lot # 062124

1 of 2

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

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



### Certified Reference Material CRM



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

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

40.02 40.01	40.2 40.02	40.02	40.2		<0.02	40.02				
8 ជ ជ	ರ ಜ	cs		င့	C	6	2	l		
20.02	3	<0.02	<0.02	<0.02	<0.2	20.02	9			
	င့	Ga	6	Eu	략	Ly		l		
3	<0.02	<0.02	<0.02	<0.02	<0.02	20.02	A0 003	١		
步	Ľ	Fe	ㅂ	Ħ	Но		H.	١		
<0.02	<0.02	<0.2	<0.02	<0.02	40.02	0 00	2000		Trace N	
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<0.2	<0.02	<0.02	<0.02	20.02	20.02	3	<0.02	1	y ICP-M	١
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20,02	20.02	40.02	20.00	3 8	20.02	<0.02	<0.02			

(T) = Target analyte

### Physical Characterization:

Al Sh As Ba Ba Bi

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

Certified by:

	Puri	굺
	Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in	certifi
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	gla	2
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the preparation of all standards.

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

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

\* Standards are prepared gravimetrically using balances that are calibrated.

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

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

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

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

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

Part # 57003 Lot # 062124

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

2 of 2



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

### M5985 R:6/14/24

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGIN10

Lot Number:

U2-IN729349

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

10 000 μg/mL ea:

Indium

Starting Material:

Indium Metal

Starting Material Lot#:

2511

Starting Material Purity:

99.9995%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

 $10022 \pm 30 \mu g/mL$ 

Density:

1.044 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

Assay Method #1

10021 ± 56 µg/mL

ICP Assay NIST SRM 3124a Lot Number: 110516

Assay Method #2

10035 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

10001 ± 33 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

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

Characterization of CRM/RM by One Method

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

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

n - Not Checked For s - Solution Standard Element

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

i - Spectral Interference

### **INTENDED USE** 6.0

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

**6.2** For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale.</u> <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° 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

February 21, 2023

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

One led TOT Deep C	San Dates	
- Sealed TCT Bag C	open Date:	

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director 20178hi



### Certificate of Analysis

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

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CLPP-CAL-3

Lot Number: T2-MEB727800

Matrix: 7% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea: Arsenic,

Arsenic, Lead, Selenium, Thallium,

500 μg/mL ea: Cadmium

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Thallium, Ti 1 000  $\pm$  7  $\mu$ g/mL

**Density:** 1.042 g/mL (measured at  $20 \pm 4$  °C)

### **Assay Information:**

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certified Value, X<sub>CRIMRM</sub>, where one method of characterization is used is the mean of individual results:

XCRM/RM = (Xa) (uchar a)

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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

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

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/A

### 6.0 INTENDED USE

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

  <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° 24° C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

December 21, 2022

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

### 11.2 Lot Expiration Date

- December 21, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control DD9784.

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

### **ACCREDITATION / REGISTRATION** 1.0

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CHEM-CLP-4

Lot Number:

V2-MEB746172

Matrix:

3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s):

1 000 µg/mL ea:

Boron,

Molybdenum,

Silicon,

Tin,

**Titanium** 

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

**ANALYTE** Boron, B

**CERTIFIED VALUE** 

**ANALYTE** Molybdenum, Mo **CERTIFIED VALUE** 

1 000 ± 5 µg/mL

Silicon, Si

1 000 ± 5 µg/mL 1 000 ± 7 µg/mL

Tin. Sn

1 000 ± 5 µg/ml.

Titanium, Ti

1 000 ± 6 μg/mL

Density:

1.032 g/mL (measured at 20 ± 4 °C)

### Assav Information:

,			
ANALYTE	METHOD	NIST SRM#	SRM LOT#
В	ICP Assay	3107	190605
В	Calculated		See Sec. 4.2
Мо	ICP Assay	traceable to 3134	U2-MO739068
Si	ICP Assay	Traceable to 3150	S2-S1702546
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	traceable to 3162a	T2-TI725816

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

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

Certified Value, X<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 i with standard uncertainty uchar i

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

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

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

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

utts = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

 $X_a = mean$  of Assay Method A with  $u_{char} = the$  standard uncertainty of characterization Method A  $CRM/RM = the standard uncertainty ($^{\pm}$) = U_{CRM/RM} = k \left(u^2_{char} + u^2_{bb} + u^2_{tts} + u^2_{ts}\right)^{\frac{1}{2}} \\ k = coverage factor = 2 \\ u_{char} = the errors from characterization \\ u_{bb} = bottle to bottle homogeneity standard uncertainty \\ u_{lts} = long term stability standard uncertainty (storage) \\ u_{tg} = transport stability standard uncertainty$ 

Characterization of CRM/RM by One Method

is used is the mean of individual results:

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

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization

- 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° 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.lnorganicventures.com/TCT
   HF Note: This standard should not be prepared or stored in glass.

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

August 12, 2024

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

### 11.2 Lot Expiration Date

- August 12, 2029
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

- Sealed TCT Ba	ad Open Date:	

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

Paul R Sains

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director



300 Technology Drive Christiansburg, VA 24073 USA

inorganicventures.com

Certificate of Analysis

M6074

M6075 M6076 M6077

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

EXP. 9/6/2029

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CHEM-CLP-4

Lot Number:

V2-MEB746762

Matrix:

3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s):

1 000 µg/mL ea:

Boron,

Molybdenum,

Silicon,

Tin,

Titanium

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Boron, B **CERTIFIED VALUE** 

ANALYTE Molybdenum, Mo **CERTIFIED VALUE** 

1 000 ± 5 μg/mL

Silicon, Si

1 000 ± 5 µg/mL

Tin, Sn

1 000 ± 5 µg/mL

Titanium, Ti

1 000 ± 7 μg/mL

1 000 I 5 pg/mL

1 000 ± 6 µg/mL

Density:

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

### **Assay Information:**

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certified Value, X<sub>CRW/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

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### **INTENDED USE** 6.0

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

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

### 7.1 Storage and Handling Recommendations

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- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT HF Note: This standard should not be prepared or stored in glass.

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

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- QSR Certificate Number QSR-1034

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

### 11.1 Certification Issue Date

September 06, 2024

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

### 11.2 Lot Expiration Date

- September 06, 2029
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### 11.3 Period of Validity

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

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

Paul R Sains

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Certificate Approved By:

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director



300 Technology Drive Christiansburg, VA 24073 USA

inorganicventures.com

Certificate of Analysis

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

EXP. 9/6/2029

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3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s):

1 000 µg/mL ea:

Boron,

Molybdenum,

Silicon,

Tin,

Titanium

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ANALYTE Boron, B **CERTIFIED VALUE** 

ANALYTE Molybdenum, Mo **CERTIFIED VALUE** 

1 000 ± 5 μg/mL

Silicon, Si

1 000 ± 5 µg/mL

Tin, Sn

1 000 ± 5 µg/mL

Titanium, Ti

1 000 ± 7 μg/mL

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Density:

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

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Sn	ICP Assay	3161a	140917
Ti	ICP Assay	traceable to 3162a	T2-TI725816

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uts = transport stability standard uncertainty

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

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### **INTENDED USE** 6.0

- 6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.
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- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT HF Note: This standard should not be prepared or stored in glass.

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### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

### 11.1 Certification Issue Date

September 06, 2024

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

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

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

Paul R Sains

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

M6125 Receive -> 11/22/24

### **CORCO CHEMICAL CORPORATION**

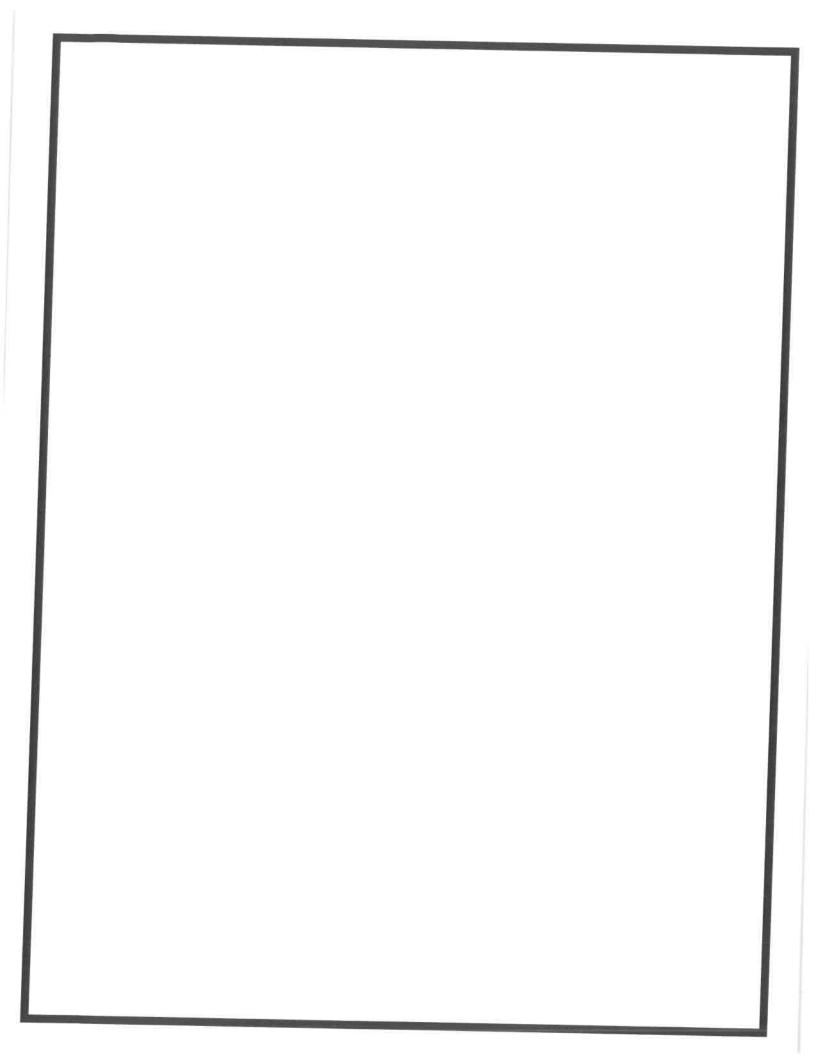
Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

Office and Plant 299 Cedar Lane Fairless Hills, PA 19030

Phone: 215-295-5006 Fax: 215-295-0781

### Hydrogen Peroxide 30%, ACS Reagent Grade

SPECIFICATION	MAXIMUM LIMITS
Appearance	Colorless and free from suspended matter or sediment
Assay	29-32%
Color (APHA)	10
Residue after Evaporation	0.002%
Titratable Acid	0.0006 meq/g
Chloride (CI)	3 ppm
Nitrate (NO <sub>3</sub> )	2 ppm
Phosphate	2 ppm
Sulfate (SO <sub>4</sub> )	5 ppm
Ammonium (NH <sub>4</sub> )	5 ppm
Heavy Metals (as Pb)	1 ppm
Iron (Fe)	0.5 ppm







R -> 11/12/24

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

Manufactured Date: 2024-03-26

Retest Date: 2029-03-25

Revision No.: 0

### Certificate of Analysis

Test	Specification	Result
Assay (HNO3)	69.0 – 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	1 ppm
Chloride (CI)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (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	2.3 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	100 ppb
Trace Impurities – Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities – Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>

Nitric Acid 69% CMOS





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

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Cloak

Director Quality Operations, Bioscience Production



## Certified Reference Material CRM



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

m/z->	1.0 m 4	1000	m/z-> 2000	6.0E6	1.0E8	Compound RM# Number  1. Magnesium nitrate hexahydrate (Mg) IN030 маровгогдал	Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	Expiration Date:	Par Lo
N 10			ō		[1] Spectrum No.1	nydrate (Mg)	NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Expiration Date: nended Storage:	Part Number: Lot Number: Description:
					3 Z 0	RIM# Nu NO30 MGDO	10000 6UTB diluted to (mi	112 Ami	112 Ma
	Ñ	·  -  -	20			- 11		112127 Ambient (20 °C)	58112 112124 Magnesium
ļ. 	130		30		9.923	Nominal Conc. (µg/mL) 10000	2000.07	0	IPM TO
					ec];581	(%) (%) Purity (	5E-05 B	9	5
	4		<b>A</b> •		*	Uncertainty Purity (%) 0.10	5E-05 Balance Uncertainty 0.100 Flask Uncertainty		10 x 1/13/250 Nont:
			70		Count	Assay (%) v	ainty ity	2%	vent: 2
	150		50			Target Weight (g) 234.9183		40.0 (mL)	24012496
	100		<b>G</b> .		.j    [6	Actual Weight (g)		Nitric Acid	Nitric Acid
	170		70		- 11	Actual Conc. (µg/mL)			bid.
					No.	Uncertainty +/- (µg/mL)	Reviewed By:	Formulated By:	32
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					on-rat 5440 mg/kg 3131a	рд.) Ш50	112124	112124	

Part # 58112

1 of 2

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

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10:00	3	∆ 0.02	40.02	20.02	20.0	3 6	<0.02	<0.02			

(I) = larget analyte

### Physical Characterization:

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

Certified by:

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

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

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

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

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

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

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

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

Part # 58112

2 of 2

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Part Number:

Lot Number:



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

CERTIFIED WEIGHT REPORT:

Formulated By: Diovannie Giovanni Esposito 2 Septe 101124

Pedro L. Rentas

101124

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

Manganese (Mn)

Ambient (20 °°)

Manganese (20 °°) 1000

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

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/ml.)

+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM NIST T SDS Information

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

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

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

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

(T) = Target analyte

### Physical Characterization:

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

### Certified by:

Jon 7 Mills

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



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M6137

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGSI1

Lot Number:

V2-SI744713

Matrix:

tr. HNO3

tr. HF

Value / Analyte(s):

1 000 µg/mL ea:

Silicon

Starting Material:

Silica

Starting Material Lot#:

1771

Starting Material Purity:

99.9981%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

999 ± 6 µg/mL

Density:

1.003 g/mL (measured at 20 ± 4 °C)

### **Assay Information:**

Assay Method #1

999 ± 5 µg/mL

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

Assay Method #2

1000 ± 7 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

Certified Value, X<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  $\mathbf{i}$  with standard uncertainty  $\mathbf{u}_{char}$   $\mathbf{i}$  $\mathbf{w}_{i}$  = the weighting factors for each method calculated using the inverse square of the variance:

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

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

k = coverage factor = 2

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

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

X, = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u<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.

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

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

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

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

### 6.0 **INTENDED USE**

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

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

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

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### **QUALITY STANDARD DOCUMENTATION** 10.0

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

July 10, 2024

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

### 11.2 Lot Expiration Date

- July 10, 2029
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

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

**Uyen Truong** Custom Processing Supervisor

Mayyand Man
Paul R. Laine

### Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

**Certifying Officer:** 

**Paul Gaines** Chairman / Senior Technical Director

## Certified Reference Material CRM 6138





orl-rat >2000mg/kg 3109a NIST SRM 121824 121824 (Solvent Safety Info. On Attached pg.) 200 100 SDS Information Giovanni Esposito OSHA PEL (TWA) Pedro L. Rentas 5 mg/m3 190 00 Diovarine 471-34-1 CAS# 180 80 Formulated By: Reviewed By: +/- (ng/mL) Uncertainty Expanded 20.0 470 0 Conc. (µg/mL) 10001.4 Actual Nitric Acid Nitric Acid 100.2677 160 9 Weight (g) Actual [ 12.514 sec]:58120.D# [Count] [Linear] Solvent: 24012496 100.2537 Weight (g) 80.0 (III) Target 150 250 50 39.9 5% Assay 5E-05 Balance Uncertainty 8 0.15 Flask Uncertainty 140 240 0 Uncertainty Purity (%) 0.10 R>1/13/25 Purity 99.999 (<del>%</del>) 130 230 30 Conc. (µg/mL) 10000 4000.1 Nominal Ambient (20 °C) Calcium (Ca) 120 220 S IN014 CAD032023B3 Weight shown below was diluted to (mL): 121824 121827 10000 58120 Number **6UTB** ē [1] Spectrum No.1 RN# 110 210 0 Recommended Storage: NIST Test Number: Part Number: Lot Number: Description: **Expiration Date:** Nominal Concentration (µg/mL): CERTIFIED WEIGHT REPORT: 1. Calcium carbonate (Ca) 1,0日4 2.5E4 4.0ES 5.0E4 **5.0**E4 2.0E4 Y-2/E V-Z/E ~-Z/W Compound

Lot # 121824

Printed: 1/10/2025, 4:48:14 PM

## Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

							Trace Me	tals	Verificat	ion	by ICP-M.	S	g/mL)						
1	The second			i			ALL NO - STATE OF			TION IN	The state of the s					0			
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_	€0.05	రే	L	西	_	Но	<0.02	3	<0.02	g	<0.02	\$	<0.02	Şi	<0.02	<u>e</u>	<0.02	ב	<0.02
As	<0.2	ő	<0.02	En	_	되	<0.02	M	<0.01	ő	<0.02	Rh	<0.02	Ag	<0.02	F	<0.02	>	<0.02
_	<0.02	ű	<0.02	E	_	I	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Ę	<0.02	χp	<0.02
Be	<0.0>	Ö	<0.02	Ğ	<0.02	Fe	30	Hg	<0.2	Д	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	¥	<0.02
	<0.02	ථ	40.02	Ö	_	Ľ.	<0.02	Mo	<0.02	£	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
Е	<0.02	đ	<0.02	Au	Ĭ	£	<0.02	PN	<0.02	¥	<0.2	Sc	<0.02	Ta	<0.02	F	<0.02	Zr	<0.02

(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 the preparation of all standards.

<sup>\*</sup> 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.

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

<sup>&#</sup>x27;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).

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

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

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

m/z->

210

220

230

240

250

200

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



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

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

1	L	H	ы	क	7	S	,			1
	В	34.	ĕ	32	As	ď		1		I
	<0.02	40.02	<0.01	40.02	0.2	40.02	<0.02			
	Cu	ဝ	ΰ	င္တ	င္ပ	Ç	S	i		
	<0.02	<0.02	<0.02	<0.02	40.02	40.2	40.02			
	Αu	ත	Ga	වු	댐	田	Ņ	I		
	<0.02	40.02	<0.02	<0.02	<0.02	<0.02	<0.02			
	138	7	Fe	Ч	'n	Но	Ħ	İ		
	<0.02	<0.02	402	<0.02	<0.02	<0.02	<0.02		Trace M	
	M	Mo	Hg	Mn	Mg	Ľ	Ε.	İ	Metals	
(T) - Tamet analyte	<0.02	<0.02	02	<0.02	<0.01	<0.02	<0.02		Verifica	
not an	×	7	P	Pd	S <sub>O</sub>	7	Z	I	tion	
ahrio	T	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		by ICP-	
	Sc	Sm	Ru	Rb	字	Re	꾸	ı	NS (	
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		(μg/mL)	
	Ta	S	Sr	N <sub>B</sub>	Ag	Si	Se	I		I
	<0.02	<0.02	<0.02	40.2	<0.02	<0.02	<0.2			
	7.	Sn	Tm	H	=	Te	Тb	l		I
	<0.02	40.02	△0.02	€0.02	₫.02	40.02	<0.02			
	Zr	Zn	¥	4	<	c	W	I		
	40.02	0.02	40.02	<0.02	40.02	40.02	<0.02			

(i) = larger analyre

### Physical Characterization:

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

Certified by:

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

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

Part # 57119

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## Certified Reference Material CRM



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

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

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

1 of 2

www.absolutestandards.com



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

В	<u>58</u>	Be	Ba	As	Sb	≥		٦
<0.02	<0.02	<0.01	<0.02	40.2	<0.02	<0.02		
5	င္ပ	Ω	င္တ	දි	C2	S		
<0.02	<0.02	<0.02	<0.02	<0.02	<b>∆0.2</b>	<0.02		
Au	ဂ္ဂ	ଦ୍ଧ	<u>ਨ</u>	Eu	E)	Дy		١
40.02	<0.02	<0.02	△0.02	<0.02	△0.02	<0.02		
Pb	L	Fe	F	In	Но	Hf		١
<0.02	<0.02	40.2	<0.02	<0.02	<0.02	<0.02		Trace M
Z.	Mo	Hg	Mn	Mg	L	Е		etals
40.02	<0.02	40.2	<0.02	<0.01	<0.02	<0.02		Verifica
×	₽	٩	Pd	°S O	ğ	Z		iti. On
40.2	<0.02	0.02	A.02	40,02	40.02	<0.02		by ICP-N
Se	Sm	Ru	Rb	Rh	Re	Pr		S (II
<0.02	<0.02	<0.02	<0.02	<0.02	40.02	<0.02	9,,	a/mL)
Ta	Ç0	Sr	Z	Ag	S:	જ		
40,02	40.02	△0.02	-7	<0.02	<0.02	40.2		
	Sn	Tm	H	⊒	Te	13		
40,02	40.02	<0.02	<0.02	40.02	<0.02	<0.02		
12	Zn	۲	44	<	c	₩		
20.02	A0.02	40.02	<0.02	<0.02	<0.02	<0.02		

(T) = Target analyte

### Physical Characterization:

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

Certified by:

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

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

All standard containers are meticulously cleaned prior to use.

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

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

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

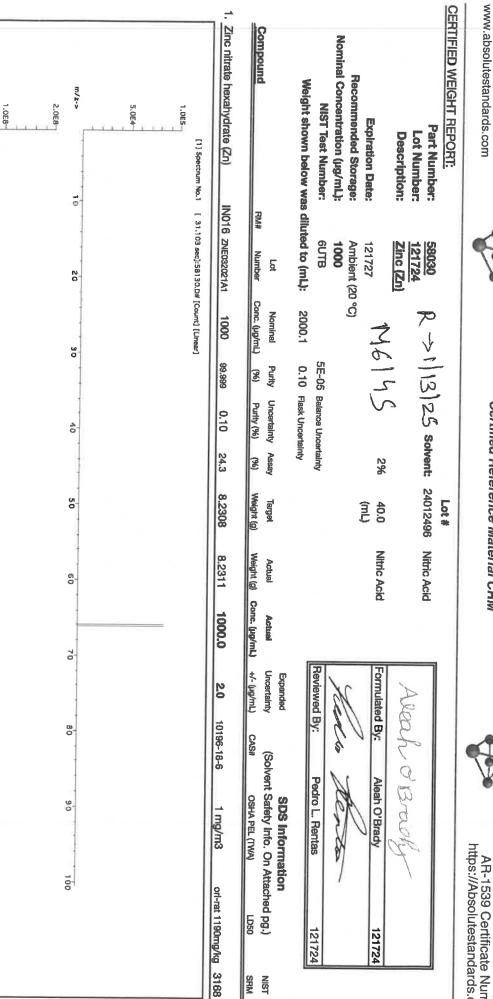
Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58111

Certified Reference Material CRM



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



NIST SRM

m/z->

210

220

230

240

250

260

m/z->

110

120

130

140

50

160

170

180

190

200

1.0E8

5.0E7

www.absolutestandards.com



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

ſ	W	<u>B</u> 1	1	E e	Ба	1	As		Ş	2	Δ1		Ī			
	40.02	20.02		<u>0</u> 001	70.0>	3	40.2		40.02	*****	co or					
	5	S	2	찬 -	Ç	,	င္ပ	1	C	2	2					
	40.02	20.02	3	40.02	20.02	3	20.02		٥		4000					
Ì	Au	C	,	ටු	0	5	E	1	4	J	DV		١			
	<0.02	20.03	3	0.02	10.04	3	20.02		40.02		<0.02					
	Pb	La	- i	ře	-	7	III	7	HO		Hf		۱			
	<0.02	10.02	3	402	40.04	3	20.02	3	20.02		0.02			LIGCE IN		
	Z	0.10	2	Hg Hg		N N	STAT	78.	F	•	1			ACCOIN	2+3	
	20,02	500	3	2.0	200	A) (2)	10.01	100	70.02	2	40.02			ACHILO	くりだけい	
	7	: :	ğ	7	; ;	P	S	<u></u>	ON	Í	Z			3 (10)	34.	
	702	5 6	A 33	20.02	3	A.03	10.01	3	20.02	3	40.02			wy ivi	-dd.	
	30	2	Sm	Xii	7	25		<del>ك</del>	No	0	H			140	7	
	20.02	3	8	20.02	3	40.02		8	20.0%	3	20.02			//B		
	ΔÃ	7	S	2	?	Na	1 0	Ag	22	2	ŭ	2				
	10.02	3	<0.02	20.02	3	4		∆ 0.02	40101	200	202	3				
		<u>.</u> !	Sn	1 1	3	III	1		;	100	ç	7	-			
	10102	4000	20.02	0 00	3	20.02	2	20.02		<b>△</b> 0.02	10.04	20.03				
		72	0.2	3,	<	TU	ç	<	4.7	C;	**	W				
		40.02	-	3	A).02	10.04	3	20.02	3	<u>0.02</u>	40,000	200				

(T) = Target analyte

### Physical Characterization:

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

Certified by:

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

Part # 58030



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

R: 4/20/21

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

\* M6150

**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 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% (v/v) nitric acid.

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 K<sub>3</sub>Fe(CN)<sub>8</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	(after 50-fold dilution)   500   200   200   100   100   100   2000					
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (µg/L) (after 50-fold dilution)					
Al	2500						
Sb	1000						
As	1000	200					
Ba	520	100					
Be	510						
Cd	510						
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	SPILE/	ICV6-0400
Element	Concentration (µg/L) (after 100-fold dilution)	Analyte	Concentration (µg/L) (after 100-fold dilution)
Hg	4.0	CN-	99

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





M6151

R-> 1/15/25

Material No.: 9530-33

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

Retest Date: 2027-06-14

Revision No.: 0

### Certificate of Analysis

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

>>> Continued on page 2 >>>

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





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

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

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





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

Test

Specification

Result

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

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







R-02/02/2025

M-6158

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

Manufactured Date: 2024-03-26

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

### Certificate of Analysis

Test	Specification	Result
Assay (HNO3)	69.0 - 70.0 %	
Appearance	Passes Test	69.7 %
Color (APHA)	≤ 10	Passes Test
Residue after Ignition		5
Chloride (CI)	≤ 2 ppm	1 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.08 ppm	< 0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm
Trace Impurities - Aluminum (AI)	≤ 0.2 ppm	< 0.2 ppm
Arsenic and Antimony (as As)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Barium (Ba)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Boron (B)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Calcium (Ca)	≤ 50 ppb	< 1 ppb
Trace Impurities - Chromium (Cr)	≤ 50.0 ppb	2.3 ppb
Trace Impurities – Cobalt (Co)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Gold (Au)	≤ 20 ppb	< 10 ppb
Heavy Metals (as Pb)	≤ 20 ppb	< 5 ppb
Trace Impurities - Iron (Fe)	≤ 100 ppb	100 ppb
Trace Impurities - Lead (Pb)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities – Lead (PD)  Trace Impurities – Lithium (Li)	≤ 20.0 ppb	< 10.0 ppb
	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>





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

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

Nitric Acid 69% **CMOS** 





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

Test Specification Result

For Microelectronic Use

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

Jamie Croak Director Quality Operations, Bioscience Production

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

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

Physical Characterization:

(T)= Target analyte

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

Certified by:

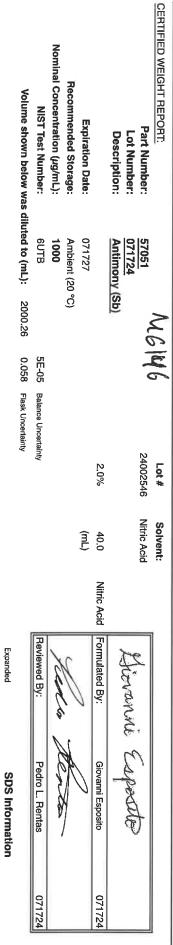
- \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- \* All standard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

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



### R:10/18/24 Certified Reference Material CRM

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



Compound

Number Part

Number Ę

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/mL) Uncertainty

CAS#

OSHA PEL (TWA)

LD50

NIST SRM

(Solvent Safety Info. On Attached pg.)

Dilution Factor

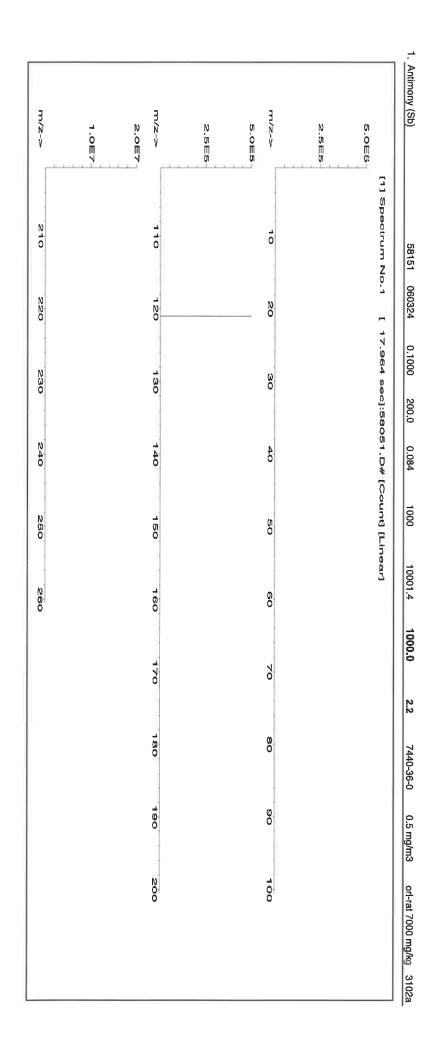
Initial

Uncertainty

Nominal

Initial

Final



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

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

(I) = larget analyte

### **Physical Characterization:**

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

Certified by:

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

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

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

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

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

### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "Ap 1,50,9001:20,450,5004; Gedified Program"

"An ISO 9001:2015 Certified Program"



Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

N6152

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

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

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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

Page 1 of 2

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

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

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



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



### Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-AES.

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

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

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

HgiH timid (J\bu)	wod Limit (J\gy)	A haq 4 haq+ (J\by)	High Himid (A\g4)	Low Limit (µg/L)	A hsq (J\gy)	свог	Flement
285000	509000	247000	294000	216000	S22000	200	IA
117	979	818	0.09	0.09-	(0.0)	09	9S
120	4.88	104	0.01	0.01-	(0.0)	01	sA
757	337	(537)	506	<b>⊅6</b> ŀ-	(0.9)	200	Ba
078	420	967	0.3	0.8-	(0.0)	0.8	Be
1120	928	279	0.8	0.4-	(0.1)	0.8	Cd
271000	188000	532000	282000	208000	242000	2000	БЭ
429	097	242	0.28	42.0	(0.23)	01	Cr
848	t0t	974	0.03	0.03-	(0.0)	09	0)
883	434	119	0.72	0.62-	(0.2)	52	nე
114500	84400	99300	116500	00998	101000	100	Еe
0.63	39.0	(0.64)	0.01	0.01-	(0.0)	01	dЯ
286000	210000	248000	294000	216000	S22000	2000	ВМ
<b>78</b> 9	430	703	22.0	0.8-	(0.7)	91	uΜ
1100	018	<del>1</del> 26	42.0	0.86-	(0.2)	07	!N
0.18	0.11	(0.94)	35.0	0.36-	(0.0)	35	əs
232	021	201	0.01	0.01-	(0.0)	01	₽A
133	0.88	(801)	0.82	0.82-	(0.0)	52	ΙL
999	714	167	0.03	0.08-	(0.0)	90	Λ
960L	608	796	0.09	0.09-	(0.0)	09	uZ

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



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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request M6153

### (A) SAMPLE DESCRIPTION

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

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

### (B) BREAKAGE OR MISSING ITEMS

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

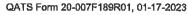
QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120

### (C) ANALYSIS OF SAMPLES

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

Page 1 of 2











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

### **APTIM**

### Instructions for QATS Reference Material: ICP-AES ICS

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

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

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-AES.

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

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

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

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

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

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- 8			



### Certificate of Analysis

ustry. R: 8/5/24

M6019

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Single Analyte Custom Grade Solution

Catalog Number:

CGSR1

Lot Number:

U2-SR730227

Matrix:

0.1% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea:

Strontium

Starting Material:

SrCO3

Starting Material Lot#:

M2-2192

Starting Material Purity:

99.9993%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

1001 ± 3 µg/mL

Density:

1.000 g/mL (measured at 20 ± 4 °C)

### Assay Information:

Assay Method #1

998 ± 4 µg/mL

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

Assay Method #2

1001 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

1001 ± 2 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty (stora

### 4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

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

### 6.0 INTENDED USE

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

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

<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

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

March 03, 2023

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

- Sealed TCT Bag Open Date:	
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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.

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director 20178hi



### Certificate of Analysis

ustry. R: 8/5/24

M6019

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Single Analyte Custom Grade Solution

Catalog Number:

CGSR1

Lot Number:

U2-SR730227

Matrix:

0.1% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea:

Strontium

Starting Material:

SrCO3

Starting Material Lot#:

M2-2192

Starting Material Purity:

99.9993%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

1001 ± 3 µg/mL

Density:

1.000 g/mL (measured at 20 ± 4 °C)

### Assay Information:

Assay Method #1

998 ± 4 µg/mL

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

Assay Method #2

1001 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

1001 ± 2 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty (stora

### 4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

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

### 6.0 INTENDED USE

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

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March 03, 2023

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- Sealed TCT Bag Open Date:	
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### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director 20178hi

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

www.absolutestandards.com



## Certified Reference Material CRM

M6023

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

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

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Part # 57081



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.

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

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

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

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

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

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

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

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

www.absolutestandards.com



# Certified Reference Material CRM

M6021

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

CERTIFIED WEIGHT REPORT Part Number: Lot Number: 57023 062424 24002546 Nitric Acid Solvent:

Nitric Acid

Ambient (20 °C) 2.0% (III) 40.0

Formulated By:

Aleah O'Brady

062424

ASSET O DE LONG

Recommended Storage:

**Expiration Date:** 

062427

Description:

Vanadium (V)

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): **NIST Test Number: 6UTB** 1000 2000.3 5E-05 0.06 Balance Uncertainty Flask Uncertainty Reviewed By:

Pedro L. Rentas

062424

Ammonium metavanadate (V) Compound 58123 Number Part 021224 Number ρţ 0.1000 Dilution Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) 200.0 Initial Uncertainty 0.084 Nominal 1000 Conc. (µg/mL) Conc. (µg/mL) 10000.3 nitial 1000.0 Final +/- (µg/mL) Uncertainty Expanded 22 7803-55-6 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) 0.05 mg/m3 **SDS Information** orl-rat 58.1mg/kg LD50 3165 NIST SRM

V-4 K	2.588	m/z->- 5.0E8	1.0E7	m/z->	1.006	2.006
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Part # 57023

# 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).