

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

8900, Fax: 908 789 8922

Prep Standard - Chemical Standard Summary

Order ID: Q1883

Test: SPLP Mercury, SPLP MetalGroup3

Prepbatch ID: PB167780,PB167789,

Sequence ID/Qc Batch ID: LB135594,LB135595,

Standard ID:

MP85156, MP85240, MP85241, MP85242, MP85243, MP85351, MP85352, MP85353, MP85355, MP85356, MP85357, MP85357, MP85360, MP85361, MP85362, MP85363, MP85365, MP85366, MP85366, MP85366, MP85369, MP85369, MP85370, MP85371, MP85372, MP85373, MP85374, MP85479, MP85480, MP85481, MP85482, MP85483, MP85484, MP85485, MP85486, MP85487, MP85489, MP85489, MP85490, MP85492, MP85487, MP85488, MP85489, MP85489, MP85490, MP85492, MP85489, M

Chemical ID:

 $\begin{array}{l} M4251, M4465, M4916, M5062, M5305, M5471, M5520, M5532, M5658, M5697, M5739, M5751, M5798, M5799, M5800, M5801, M5811, M5815, M5817, M5873, M5874, M5882, M5884, M5942, M5961, M5962, M5977, M5981, M6021, M6023, M6025, M6026, M6028, M6030, M6032, M6041, M6055, M6079, M6086, M6087, M6127, M6128, M6137, M6144, M6145, M6146, M6150, M6151, M6153, M6158, M6159, M6160, W3112, \\ \end{array}$





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
170	1:1HCL	MP85156	04/07/2025	08/18/2025	Kareem Khairalla	None	None	04/07/2025

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

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3965	2:1 H2SO4 : HNO3	MP85240	04/16/2025	10/16/2025	Mohan Bera	None	None	04/29/2025

FROM 1600.00000ml of M6041 + 800.00000ml of M6158 = Final Quantity: 3200.000 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
65	POTASSIUM PERMANGANATE SOLUTION 5 %	MP85241	04/16/2025	10/16/2025		METALS_SCA LE_3 (M SC-3)		04/29/2025

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
66	POTASSIUM PERSULFATE SOLUTION 5 %	MP85242	04/16/2025	08/06/2025		METALS_SCA LE_3 (M SC-3)		04/29/2025

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



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Metals STANDARD PREPARATION LOG

Recip 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	2000.00000ml of W3112 + 240.00000gram of M4251 + 240.00000gram of M5884 = Final Quantity: 2000.000 ml

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1122	ICPMS CALIB BLANK(S0/ICB/CCB)	MP85351	04/14/2025	05/05/2025		METALS_SCA LE_3 (M SC-3)	_	04/29/2025

FROM 25.00000ml of M6151 + 4925.00000ml of W3112 + 50.00000ml of M6158 = Final Quantity: 5000.000 ml



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Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
2902	S8 ICPMS	MP85352	04/14/2025	05/05/2025		METALS_SCA	_	
						LE_3 (M SC-3)	ETTE_3 (A)	04/29/2025

FROM

 $1.00000 ml \ of \ M6159 + 2.50000 ml \ of \ M5520 + 2.50000 ml \ of \ M5811 + 5.00000 ml \ of \ M6086 + 5.00000 ml \ of \ M6127 + 5.00000 ml$

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
3947			04/14/2025	05/05/2025	Janvi Patel		METALS_PIP ETTE_3 (A)	

FROM

0.10000 ml of M6153 + 1.00000 ml of M5799 + 1.00000 ml of M5981 + 1.00000 ml of M6079 + 1.00000 ml of M6137 + 1.90000 ml of M6159 + 10.00000 ml of M5942 + 10.00000 ml of M5977 + 10.00000 ml of M6158 + 2.00000 ml of M5815 + 2.00000 ml of M5815 + 2.00000 ml of M5817 + 4.00000 ml of M6025 + 4.00000 ml of M6032 + 4.90000 ml of M5520 + 4.90000 ml of M5811 + 5.00000 ml of M5305 + 830.50000 ml of W3112 + 9.00000 ml of M5697 + 9.00000 ml of M6128 + 9.00000 ml of M6145 + 9.90000 ml of M6086 + 9.90000 ml of M6127 + 9.90000 ml of M6144 = Final Quantity: 1000.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal		
3948	S6(SFAM,6020,200.8)	MP85355	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	,		

FROM 0.50000ml of M6151 + 1.00000ml of M6158 + 48.50000ml of W3112 + 50.00000ml of MP85353 = Final Quantity: 100.000 ml

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By Sarabjit Jaswal
3949	S5(SFAM,6020,200.8)	MP85356	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	,

FROM 0.50000ml of M6151 + 1.00000ml of M6158 + 73.50000ml of W3112 + 25.00000ml of MP85353 = Final Quantity: 100.000 ml



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Metals STANDARD PREPARATION LOG

ID NA	AME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabiit Jaswal
3954 S4((SFAM,6020,200.8)	MP85357	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	,

FROM	0.50000ml of M6151 + 1.00000ml of M6158	3 + 86.00000ml of W3112 + 12.50000ml of MP85353 = Final Quantity: 100.000 ml
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Reci	<u>pe</u>			Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
395	1 S3(SFAM, 6020,200.8)	MP85358	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP	
							ETTE_3 (A)	04/29/2025

FROM 0.50000ml of M6151 + 1.00000ml of M6158 + 88.50000ml of W3112 + 10.00000ml of MP85355 = Final Quantity: 100.000 ml



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Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
3955	S2CONC(SFAM,6020,200.8)	MP85360	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE 3 (A)	
							E11E_3 (A)	04/29/2025

FROM

0.00500 ml of M6153 + 0.05000 ml of M5798 + 0.05000 ml of M5800 + 0.05000 ml of M5801 + 0.05000 ml of M5961 + 0.05000 ml of M6023 + 0.05000 ml of M6025 + 0.05000 ml of M6028 + 0.05000 ml of M6030 + 0.05000 ml of M6128 + 0.10000 ml of M5658 + 0.10000 ml of M5751 + 0.10000 ml of M6146 + 0.10000 ml of M6159 + 0.25000 ml of M5799 + 0.25000 ml of M5811 + 0.25000 ml of M5942 + 0.25000 ml of M5962 + 0.25000 ml of M5977 + 0.25000 ml of M6031 + 0.25000 ml of M6145 + 0.50000 ml of M6032 + 0.50000 ml of M6137 + 1.25000 ml of M5815 + 1.25000 ml of M5817 + 1.25000 ml of M6144 + 2.50000 ml of M6158 + 2.50000 ml of M3112 = Final Quantity: 250.000 ml

Recipe	NAME	NO	Prep Date	Expiration	<u>Prepared</u> By	ScaleID	BinottolD	Supervised By
<u>ID</u> 3956		NO. MP85361	04/14/2025	<u>Date</u> 05/05/2025	Janvi Patel		PipetteID METALS PIP	Sarabjit Jaswal
	, , ,						ETTE_3 (A)	04/29/2025

FROM 0.50000ml of M6151 + 1.00000ml of M6158 + 98.00000ml of W3112 + 0.50000ml of MP85360 = Final Quantity: 100.000 ml





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Metals STANDARD PREPARATION LOG

3957 S1(SFAM,6020,200.8) MP85362 04/14/2025 05/05/2025 Janvi Patel None METALS_PIP ETTE_3 (A) 04/29/2025	Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
	3957	S1(SFAM,6020,200.8)	MP85362	04/14/2025	05/05/2025	Janvi Patel	None	_	

FROM	0.50000ml of M6151 + 1.00000ml of M6158	+ 88.50000ml of W3112 + 10.00000ml of MP85361	= Final Quantity: 100.000 ml
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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3958	ICV(SFAM)	MP85363	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	•

FROM 2.00000ml of M6150 + 98.00000ml of MP85351 = Final Quantity: 100.000 ml



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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3961	ccv	MP85365	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	,

FROM

0.20000 ml of M6026 + 0.50000 ml of M5471 + 0.50000 ml of M5799 + 0.50000 ml of M5981 + 0.50000 ml of M6079 + 0.50000 ml of M6137 + 1.00000 ml of M5815 + 1.00000 ml of M5817 + 10.00000 ml of M6158 + 12.45000 ml of M5520 + 12.45000 ml of M5811 + 2.00000 ml of M6032 + 24.90000 ml of M6087 + 24.95000 ml of M6127 + 24.95000 ml of M6144 + 25.00000 ml of M6144 + 25.00000 ml of M6159 + 4.50000 ml of M6158 + 4.50000 ml of M6159 + 5.00000 ml of M6151 + 5.50000 ml of M5942 + 5.50000 ml of M5977 + 824.15000 ml of W3112 = Final Quantity: 1000.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1142	ICSA ICPMS	MP85366	04/14/2025	04/30/2025	Janvi Patel	None	METALS_PIP	
							ETTE_3 (A)	04/29/2025

FROM 10.00000ml of M5873 + 90.00000ml of MP85351 = Final Quantity: 100.000 ml





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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1143	ICSAB ICPMS	MP85367	04/14/2025	04/30/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	04/29/2025

FROM	10.00000ml of M5873 + 10.00000ml of M5874	+ 80.00000ml of MP85351	= Final Quantity: 100.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabiit Jaswal
3962	MG 10PPM FOR TUNE	MP85368	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	

FROM 0.01000ml of M6127 + 9.99000ml of MP85351 = Final Quantity: 100.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
3894	TUNE 200PPB	MP85369	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	04/29/2025

FROM 2.00000ml of M6055 + 2.00000ml of MP85368 + 96.00000ml of MP85351 = Final Quantity: 100.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3903	ISS 3PPM	MP85370	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	•

FROM 5.00000ml of M6158 + 75.00000ml of M5739 + 170.00000ml of MP85351 = 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>PipettelD</u>	Supervised By Sarabiit Jaswal
3880	M&B SPIKE-1	MP85371	04/14/2025	05/05/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	,

FROM

5.00000ml of M5471 + 5.0000ml of M5658 + 5.0000ml of M5798 + 5.0000ml of M5800 + 5.0000ml of M5961 + 5.0000ml of M5962 + 5.0000ml of M5981 + 5.0000ml of M6021 + 5.0000ml of M6023 + 5.0000ml of M6028 + 5.0000ml of M6030 + 5.0000ml of M6079 + 5.0000ml of M6160 + 35.0000ml of MP85351 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By
3881	<u> </u>		04/14/2025	05/05/2025	Janvi Patel		METALS_PIP	
							ETTE_3 (A)	04/29/2025

FROM

 $10.00000 ml of M5942 + 10.00000 ml of M5977 + 12.50000 ml of M5520 + 12.50000 ml of M5811 + 12.50000 ml of M6032 + \\ 2.50000 ml of M5799 + 2.50000 ml of M6137 + 5.0000 ml of M6159 + 32.50000 ml of MP85351 = Final Quantity: 100.000 ml$



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Metals STANDARD PREPARATION LOG

Recipe ID 3882	NAME M&B SPIKE-3	NO. MP85373	Prep Date 04/14/2025	Expiration Date 05/05/2025	Prepared By Janvi Patel	ScaleID None	PipetteID METALS_PIP	Supervised By Sarabjit Jaswal	
							ETTE_3 (A)	04/29/2025	
FROM 0.62500ml of M6026 + 12.50000ml of M5697 + 12.50000ml of M6128 + 12.50000ml of M6145 + 11.87500ml of MP85351 =									

0.62500ml of M6026 + 12.50000ml of M5697 + 12.50000ml of M6128 + 12.50000ml of M6145 + 11.87500ml of MP85351 = Final Quantity: 50.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> By	ScaleID	<u>PipetteID</u>	Supervised By
3900			04/14/2025	05/05/2025	Janvi Patel		METALS PIP	Sarabjit Jaswal
							ETTE_3 (A)	04/29/2025

FROM 6.25000ml of M6087 + 6.25000ml of M6127 + 6.25000ml of M6144 + 6.25000ml of MP85351 = Final Quantity: 25.000 ml



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Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP85478	04/29/2025	04/30/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	
	4.00000 (140450 : 0.50000 .6				0 " 1000		A)	

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

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabiit Jaswal
1340	Hg 0.00 PPB STD	MP85479	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP ETTE_5 (HG	,

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





Metals STANDARD PREPARATION LOG

Rec	pe			Expiration	Prepared			Supervised By			
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	Date	By	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal			
134	Hg 0.2 PPB STD	MP85480	04/29/2025	04/30/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	,			
FRO	FROM 2.50000ml of M6158 + 247.30000ml of W3112 + 0.20000ml of MP85478 = Final Quantity: 250.000 ml										

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1342	Hg 2.5 PPB STD	MP85481	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	04/29/2025

2.50000ml of M6158 + 245.00000ml of W3112 + 2.50000ml of MP85478 = Final Quantity: 250.000 ml **FROM**



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1343	Hg 5.0 PPB STD	MP85482	04/29/2025	04/30/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	
	0.50000 1.110450 0.40.50000	514/0440					A)	

FROM 2.50000ml of M6158 + 242.50000ml of W3112 + 5.00000ml of MP85478 = Final Quantity: 250.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1344	Hg 7.5 PPB STD	MP85483	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP ETTE_5 (HG	•

FROM 2.50000ml of M6158 + 240.00000ml of W3112 + 7.50000ml of MP85478 = Final Quantity: 250.000 ml



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Recipe ID	NAME.	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1345	Hg 10.0 PPB STD	MP85484	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP ETTE_5 (HG	
							A)	

FROM 2.50000ml of M6158 + 237.50000ml of W3112 + 10.00000ml of MP85478 = Final Quantity: 250.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1346	Hg ICV SOLUTION	MP85485	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	04/29/2025

FROM 2.50000ml of M5532 + 2.50000ml of M6158 + 245.00000ml of W3112 = Final Quantity: 250.000 ml



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME.	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal		
1351	ICB (Hg 0.00 PPB SOLUTION)	MP85486	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP ETTE_5 (HG			
	A)									

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

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1358	CCV (Hg 5.0 PPB SOLUTION)	MP85487	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP ETTE_5 (HG	,

FROM 485.00000ml of W3112 + 5.00000ml of M6158 + 10.00000ml of MP85478 = Final Quantity: 500.000 ml



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Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1352	CCB (Hg 0.00 PPB SOLUTION)	MP85488	04/29/2025	04/30/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	
	405.00000 500000		E. 10				A)	

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

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	MP85489	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP ETTE_5 (HG	,

FROM 2.50000ml of M6158 + 247.30000ml of W3112 + 0.20000ml of MP85478 = Final Quantity: 250.000 ml



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Fax: 908 789 8922

Metals STANDARD PREPARATION LOG

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal		
1350	CHK STD (Hg 7.0 PPB SOLUTION)	MP85490	04/29/2025	04/30/2025	Mohan Bera		METALS_PIP ETTE_5 (HG			
	A)									

FROM 2.50000ml of M6158 + 240.50000ml of W3112 + 7.00000ml of MP85478 = Final Quantity: 250.000 ml

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
68	STANNOUS CHLORIDE SOLUTION	MP85492	04/29/2025	04/30/2025		METALS_SCA LE_3 (M SC-3)		04/29/2025

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



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	12/19/2018 / mohan	12/05/2018 / mohan	M4251
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3238-05 / Potassium Persulfate (2.5kg)	0000234156	08/06/2025	07/23/2019 / jaswal	07/25/2019 / manojkumar	M4465
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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 Inorganic Ventures		Lot # S2-MEB711244	-	=		
Inorganic	ItemCode / ItemName 6020CAL-1 / Calibration		Date	Opened By 03/07/2025 /	Received By 04/01/2022 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	120822	12/08/2025	08/01/2024 / Jaswal	03/17/2023 / bin	M5520
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-5 / ICV (HG)STOCK SOLN	ICV5-0415	04/30/2025	01/02/2025 / jaswal	03/30/2023 / mohan	M5532
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	060523	06/05/2026	08/28/2023 / jaswal	08/25/2023 / jaswal	M5658
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	102523	10/25/2026	04/03/2024 / jaswal	10/27/2023 / jaswal	M5697
			Evairation	Date Opened /	Received Date /	Chemtech
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Opened By	Received By	Lot #
Supplier Inorganic Ventures	6020ISS / 6020ISS, 10 ug/ml, Bi, Ho, In, 6Li, Rh, Sc, TB, Y	Lot #	-	-	Received By 04/11/2022 / jaswal	Lot # M5739
Inorganic	6020ISS / 6020ISS, 10 ug/ml, Bi, Ho, In, 6Li, Rh,		Date	Opened By 08/07/2024 /	04/11/2022 /	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	102523	10/25/2026	02/09/2024 / bin	02/09/2024 / bin	M5798
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	071123	07/11/2026	02/09/2024 / bin	02/09/2024 / bin	M5799
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	091923	09/19/2026	05/31/2024 / bin	02/09/2024 / bin	M5800
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57033 / As, 1000 PPM, 125 ml	111323	11/13/2026	02/09/2024 / bin	02/09/2024 / bin	M5801
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
	58126 / Fe, 10000 PPM,	051523	05/15/2026	02/06/2025 /	01/03/2024 /	MEOAA
Absolute Standards, Inc.	500 ml			kareem	jaswal	M5811
		Lot #	Expiration Date	Date Opened / Opened By	jaswal Received Date / Received By	Chemtech



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	071123	07/11/2026	03/01/2024 / jaswal	02/09/2024 / jaswal	M5817
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICPMS) STOCK SOLN	CP-MS ICSA-0803	04/30/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5873
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSB (ICPMS) STOCK SOLUTION	CP-MS ICSB-0803	04/30/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5874
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	232820	08/31/2028	04/30/2024 / mohan	04/25/2024 / mohan	M5882
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier Seidler Chemical	ItemCode / ItemName BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	Lot # 0000281938		· -		
	BA-3624-05 / Sodium Chloride, Crystal		Date	Opened By 04/30/2024 /	Received By 04/25/2024 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57028 / Ni, 1000 PPM, 125 ml	041124	04/11/2027	07/02/2024 / Jaswal	06/11/2024 / Jaswal	M5961
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	060624	06/06/2027	07/02/2024 / Jaswal	06/14/2024 / Jaswal	M5962
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGMO1-1 / MOLYBDENUM 125mL 1000ug/mL	T2-MO720876	07/17/2027	01/16/2025 / JANVI	02/22/2024 / Jaswal	M5977
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57092 / U, 1000 PPM, 125 ml	060724	06/07/2027	07/29/2024 / Jaswal	06/11/2024 / Jaswal	M5981
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	062424	06/24/2027	09/28/2024 / jaswal	08/05/2024 / Jaswal	M6021
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
			06/27/2027	08/05/2024 /	08/05/2024 /	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57082 / Pb, 1000 PPM, 125 ml	061224	11/09/2026	08/05/2024 / Jaswal	08/05/2024 / Jaswal	M6025
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	110923	11/09/2026	12/05/2024 / janvi	08/05/2024 / Jaswal	M6026
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 / Received By	Chemtech Lot #
Seidler Chemical	BA-9673-33 / Sulfuric Acid, Instra-Analyzed (cs/6c2.5L)	23D2462010	03/20/2028	08/16/2024 / mohan	08/16/2024 / mohan	M6041



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	IV-STOCK-12 / ICP-MS TUNING SOLUTION, 125mL	U2-MEB734294	06/21/2028	08/21/2024 / Jaswal	08/19/2024 / Jaswal	M6055
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57040 / Zr, 1000 PPM, 125 ml	071423	07/14/2026	01/15/2025 / Jaswal	09/30/2024 / Jaswal	M6079
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Calcium, 500 ml, 10000 PPM	082324	08/23/2027	03/06/2025 / JANVI	10/14/2024 / jaswal	M6086
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Calcium, 500 ml, 10000 PPM	082324	08/23/2027	01/03/2025 / janvi	10/14/2024 / jaswal	M6087
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	112124	11/21/2027	01/13/2025 / kareem	01/13/2025 / kareem	M6127
		Lot #	Expiration	Date Opened /	Received Date /	Chemtech
Supplier	ItemCode / ItemName	LOI #	Date	Opened By	Received By	Lot #

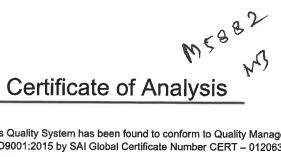


Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGSI1-1 / SILICON 125mL 1000ug/mL	V2-SI744713	07/10/2029	01/14/2025 / Jaswal	10/03/2024 / Jaswal	M6137
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / 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 /	Chemtech Lot #
Absolute Standards, Inc.	-, , ,		12/17/2027	02/04/2025 / jaswal	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 /	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 /	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 #
Inorganic Ventures	CGSR10 / Strontium (SR), 125mL 10,000ppm	V2-SR754329	02/28/2026	02/28/2025 / JANVI	01/07/2025 / JANVI	M6153
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	03/25/2029	03/10/2025 / Eman	02/02/2025 / Sagar	M6158
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / AI, 10000 PPM, 500 ml	011325	03/18/2026	03/18/2025 / kareem	02/09/2025 / kareem	M6159
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	071724	03/24/2026	03/24/2025 / kareem	10/18/2024 / kareem	M6160
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 / Iwona	W3112





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

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

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

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

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

N/A	H. M. C. S. C.		Was I will still
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

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

Revel = 10/14/2024 M 6085/M6086/M6087

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Weight shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: 10000 082324 **BTU9** 082327 58120 Ambient (20 °C) Calcium (Ca) ĕ 4000.1 Nominal 0.15 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Solvent: 24002546 Nitric Acid Assay 2% Lot # <u>a</u> 80.0 Target Nitric Acid Actual Actual Formulated By: Reviewed By: Uncertainty Expanded Thorana (Solvent Safety Info. On Attached pg.) Giovanni Esposito Pedro L. Rentas Broade **SDS Information** 082324 082324 NIST

RM#

Number

Conc. (µg/mL)

38

Purity (%)

8

Weight (g)

Weight (g)

Conc. (µg/ml.)

+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM

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www.absolutestandards.com

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

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	73	La		片	Ĭn	Но	HH			
	<0.02	<0.02	30	<0.02	40.02	<0.02	<0.02		race Me	
	M	Мо	Hg	Mn	Mg	Ę	E.		etals	
	<0.02	<0.02	<0.2	<0.02	40.01	<0.02	<0.02		Verifica	
	*	P	ъ	Pd	ô	Ä	Z	Market Mark	TI UOD	
	40.2	∆ 0.02	<0.02	40.02	<0.02	<0.02	<0.02		y ICP-M	
	Sc	Sm	Ru	Rb	R.	Re	7		in)	•
	<0.02	<0.02	<0.02	<0.02	40.02	<0.02	<0.02		J/mL)	
	Ta	S	Sr	Z	Ag	Si	Se			
	<0.02	A0.02	<0.02	40.2	<0.02	<0.02	<0.2	MODELNICK STREET		
	Ħ	Sn	Tm	ħ	Ħ	Te	41	Seminary.		
	40,02	40.02	<0.02	40.02	40.02	40.02	<0.02	DESTRUCTION IS		
	Zr	Zn	ĸ	¥	<	d	W	Name of Street		
	<0.02	40,02	<0.02	<0.02	<0.02	<0.02	<0.02			

(T) = Target analyte

Physical Characterization:

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

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

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

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

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Certified Reference Material CRM

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

Revel = 10/14/2024 M 6085/M6086/M6087

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Weight shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: 10000 082324 **BTU9** 082327 58120 Ambient (20 °C) Calcium (Ca) ĕ 4000.1 Nominal 0.15 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Solvent: 24002546 Nitric Acid Assay 2% Lot # <u>a</u> 80.0 Target Nitric Acid Actual Actual Formulated By: Reviewed By: Uncertainty Expanded Thorana (Solvent Safety Info. On Attached pg.) Giovanni Esposito Pedro L. Rentas Broade **SDS Information** 082324 082324 NIST

RM#

Number

Conc. (µg/mL)

38

Purity (%)

8

Weight (g)

Weight (g)

Conc. (µg/ml.)

+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM

m/z->	5.OE4	1.0E5	Amaggia b. And Amazona	2.55 E4	5.OE4	m/z->	1.0€4	2.0E4	
									[1] Sp
N O		110				10			[1] Spectrum No. 1
									n No. 1
220		120				N O			
27									.51 4
NSO		130	7			30			sec]:5
240		140	:			40			[12.514 sec]:58120.D# [Count] [Linear]
0		0				appropriates spinishenistenistenistenistenistenistenistenist	***************************************	indudalo antrioristr	00] #C
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			* 5 T T T T T T T T T T T T T T T T T T						
		200				100			

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

Ì	B	Bi	Вe	Ba	As	Sb	A			
	ė	٥	؋	₩ 40.02	<u>-</u>	٥	٥			
	ន	ន	01	8	2	83	02			
	δ	Ŝ	Ω	ß	ზ	ဂ္ဂ	Ω			
	40.02	40.02	40.02	<0.02	<0.02	H	40.02			
	Au	റ്റ	င္အ	ନୁ	댎	野	Dу			
	40.02	40.02	40.02	40.02	<0.02	40.02	<0.02			
	73	La		片	Ĭn	Но	HH			
	<0.02	<0.02	30	<0.02	40.02	<0.02	<0.02		race Me	
	M	Мо	Hg	Mn	Mg	Ę	E.		etals	
	<0.02	<0.02	<0.2	<0.02	40.01	<0.02	<0.02		Verifica	
	*	P	ъ	Pd	ô	Ä	Z	Market Mark	TI UOD	
	40.2	∆ 0.02	<0.02	40.02	<0.02	<0.02	<0.02		y ICP-M	
	Sc	Sm	Ru	Rb	R.	Re	7		S (Mi	,
	<0.02	<0.02	<0.02	<0.02	40.02	<0.02	<0.02		J/mL)	
	Ta	S	Sr	Z	Ag	Si	Se			
	<0.02	A0.02	<0.02	40.2	<0.02	<0.02	<0.2	MODELNICK STREET		
	Ħ	Sn	Tm	ħ	Ħ	Te	41	Semanary.		
	40,02	40.02	<0.02	40.02	40.02	40.02	<0.02	DESTRUCTION IS		
	Zr	Zn	ĸ	¥	<	d	W	Name of Street		
	<0.02	40,02	<0.02	<0.02	<0.02	<0.02	<0.02			

(T) = Target analyte

Physical Characterization:

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

Certified by:

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Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

Expiration Date:

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

SDS Information

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

NIST SRM

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

1 of 2

Certified Reference Material CRM



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

	F	בַ ע	ğ (# \$	Z :	Δ.	Ş.	2		Ī	
	10:04	3 6	9 6	2 6	3 6	A 8	800	40.02			
	2	3 5	3 5	۶ (3 5	3 5	3	2			
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yte	802	40.02	<0.02	<0.02	<0.02	<0.02	0.00	<0000		by ICP-	
	Sc	Sm	Ru	RЬ	R	Re	1	P.		NS (
	40.02	40.02	40.02	40.02	<0.02	<0.02	40.02	000		ug/mL)	
	Ta	S	Sr	Z	Age	8	č	S	200000000		
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	Zt	Zn	ĸ	뀾	<	U	*	THE PERSON NAMED IN COLUMN 1			
	<0.02	<0.02	40.02	<0.02	40.02	40,02	20.02				

Physical Characterization:

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

Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
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 * Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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Certified Reference Material CRM

M5810 M5811

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: Description:

58126 051523 Iron (Fe)

R: 01/03/24

Solvent: 21110221 Lot # Nitric Acid

Formulated By:

J. Brans

であるから

5.0%

250.0

Nitric Acid

Giovanni Esposito

051523

Reviewed By:

Pedro L. Rentas

051523

Purity Uncertainty Assay 0.12 Flask Uncertainty Expanded SDS Information

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

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

1. Iron (Fe)

Compound

RM#

Number E E

Conc. (µg/mL)

36

Purity (%)

8

Nominal

Nominal Concentration (µg/mL):

NIST Test Number:

BTUB 10000

5E-05 Balance Uncertainty

Recommended Storage:

Ambient (20 °C) 051526

Expiration Date:

Weight shown below was diluted to (mL):

5000.1

Uncertainty

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

LD50

SRM

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

70 BO 90

100

m/2->

10

20

30

40

S O

60

1.054

2.0E4

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

1.0E8

200

m/z->

110

120

130

5.0E7

1.0E8-

5.0E7

230 240

250

260

1 of 2

Lot # 051523

T/2->

210

220

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

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

	Al Sb Ba	i i
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	Ho Ho Pb	
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(T) = Tarnet analyta	40.21 40.22 40.22	erifica
	N R R R R R R R	tion
	A A A A A A A A A A A A A A A A A A A	y ICP
		-MS
	S R R R R P	ng/r
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	7 7 × 4 × c €	
	40.02 40.02 40.02 40.02 40.02	

(I) = larger analyte

Physical Characterization:

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

Certified by:

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

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

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Certified Reference Material CRM

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

R: 815/24 M6025

CERTIFIED WEIGHT REPORT: Part Number: 57182 110923 Solvent: 24002546 Lot #

Nitric Acid

Lot Number: Description: Lead (Pb)

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

Expiration Date:

110926

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

110923

Revience

40.0

Weight shown below was diluted to (mL): **NIST Test Number: 6UTB** Lot 2000.02 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Actual Actual Uncertainty Reviewed By: Expanded Pedro L. Rentas SDS information

[F.]	1. Lead(II) nitrate (Pb)	Compound
[1] Spectrum No.1	IN029 PBD122016A1	Lot Nominal Purity Uncertainty Assay Target Actual RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g)
17.284 5	11	Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) \(\begin{array}{c}\)
7	99.999	Purity (%)
של מו	0.10	Uncertainty Purity (%)
	62.5	Assay (%)
7 I I	32.0006	Target Weight (g)
	10000 99.999 0.10 62.5 32.0006 32.0040	Actual Weight (g)
		Actual Conc. (µg/mL)
	20.0	Actual Uncertainty onc. (µg/mL) +/- (µg/mL)
	10099-74-8	(Solv
	10001.1 20.0 10099-74-8 0.05 mg/m3	Actual Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (ug/mL) +/- (ug/mL) CAS# OSHA PEL (TWA) LD50
	intryns-rat 93 mg/kg 3128	tached pg.) LD50
	3128	NIST SRM

110 120 130 140 150	10 20 30 40	
120 130 140	20 30	
120 130 140	30	
130	30	
130		
140		
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	5	
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-4		
170	70	
14 00	80	
180		
19 0	9	
0	90	
200	100	

Part # 57182

1 of 2



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

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

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

Physical Characterization:

(T)= Target analyte

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

Son I Mills

Certified by:

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Certified Reference Material CRM

M6026

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

R: 8/5/24

CERTIFIED WEIGHT REPORT: Part Number: 57182 Solvent: 24002546 Lot# Nitric Acid

Description: Lot Number: 110923 Lead (Pb)

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

Revenue

1 40.0

Recommended Storage: **Expiration Date:** 10000 110926 Ambient (20 °C)

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

RW#

Nominal

Purity

Uncertainty Assay

 Lead(II) nitrate (Pb) IN029 PBD122016A1 10000 99.999 0.10 62.5 32.0006 32.0040 10001.1 20.0 10099-74-8 0.05 mg/m3 intryns-rat 93 mg/kg 3128

Number Conc. (µg/mL) 38 Purity (%) 36

Weight (g) Target Weight (g) Conc. (µg/mL) Actual Actual +/- (µg/mL) Uncertainty CAS# # OSHA PEL (TWA) LD50 OSHA PEL (TWA) SDS information TSIN SRM

Pedro L. Rentas

110923

1.0E7 [1] Spectrum No.1 [17.284 sec]:58182.D# [Count] [Linear]

180

190

200

70

80

90

100

Part # 57182

1 of 2



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

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

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

Physical Characterization:

(T)= Target analyte

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

Son I Mills

Certified by:

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

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

Suitable for Mercury Determination (hydroxylammonium chloride)

MY251





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

Manufactured Date: 2018/06/27

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

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

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

For Laboratory, Research or Manufacturing Use

Country of Origin:

CN

Packaging Site:

Paris Mfg Ctr & DC



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

James Tethier
Vice President Global Quality

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

Avantor Performance Materials, LLC

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



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

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

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

w_i = 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_{bb} = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

Xa = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²char a + u²bb + u²lts + u²ts) 1/2

k = coverage factor = 2

u_{char a} = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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 <
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   Au <
          0.003631 M Gd <
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                                              0.000402 M
                                                        Sn <
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   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 <
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                    Hq <
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M Bi <
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  Ca
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  Cd <
          0.000201 M Ir
                            0.000201 M
                                      Pt <
                                              0.000402 M Ti <
                                                               0.000402
                                              0.000201 O TI <
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  Ce <
          0.000201 O K
                            0.000020 M
                                      Rb <
                                                               0.016508
  Co <
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          0.000201 M La <
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                                      Re <
                                              0.000201 M Tm <
                                                               0.000201
  Cr <
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          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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 22, 2021

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

Sealed TCT	Bag	Open Date	:		

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Mya Truong

Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Laines



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

Matrix:

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

5% (v/v) HNO3

Catalog Number: 6020CAL-1 Lot Number: S2-MEB711244

tr. HF

Value / Analyte(s): 20 µg/mL ea:

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Assay Information:

58	say information:			
	ANALYTE	METHOD	NIST SRM#	SRM LOT#
	Ag	ICP Assay	3151 999c	160729
	Ag	Volhard		999c
	Al	ICP Assay	3101a	140903
	Al	EDTA	928	928
	As	ICP Assay	3103a	100818
	Ba	ICP Assay	3104a	140909
	Ba	Gravimetric	2405-	See Sec. 4.2
	Be	ICP Assay	3105a	090514
	Ca	ICP Assay	3109a	130213
	Ca	EDTA	928	928
	Cd	ICP Assay	3108	130116
	Cd	EDTA	928	928
	Co	ICP Assay	3113	190630
	Co	EDTA	928	928
	Cr	ICP Assay	3112a	170630
	Cu	ICP Assay	3114	121207
	Cu	EDTA	928	928
	Fe	ICP Assay	3126a	140812
	Fe	EDTA	928	928
	Fe	Calculated		See Sec. 4.2
	K	ICP Assay	3141a	140813
	K	Gravimetric		See Sec. 4.2
	Mg	ICP Assay	3131a	140110
	Mg	EDTA	928	928
	Mn	ICP Assay	3132	050429
	Mn	EDTA	928	928
	Na	ICP Assay	3152a	120715
	Na	Gravimetric		See Sec. 4.2
	Ni	ICP Assay	3136	120619
	Ni	EDTA	928	928
	Pb	ICP Assay	3128	101026
	Pb	EDTA	928	928
	Se	ICP Assay	3149	100901
	Se	Calculated		See Sec. 4.2
	TI	ICP Assay	3158	151215
	TI	Calculated		See Sec. 4.2
	V	ICP Assay	3165	160906
	V	EDTA	928	928
	Zn	ICP Assay	3168a	120629
	Zn	EDTA	928	928

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 20, 2021

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

11.2 Lot Expiration Date

- October 20, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

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

Michael 2 Booth

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

Paul R Laines

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

Description: Lot Number:

58119 120822 Potassium (K)

Solvent: 20510011 Nitric Acid

Lot #

Javanva

アイクラクスで

60.0 <u>a</u>

2%

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000 Ambient (20 °C) 120825

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

3000.4

5E-05 Belance Uncertainty

0.06 Flask Uncertainty

Nitric Acid

Formulated By:

Giovanni Esposito

120822

Reviewed By:

Pedro L. Rentas

120822

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

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

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

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Lot # 120822



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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 $\mu g/L$ (ppb) for the resulting solution(s) after the dilution of the concentrate(s) according to the following instructions. Use Class 'A' glassware to prepare the solution(s).

ICV1-1014

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

Page 1 of 2





RMs ICV 1, 5, 6 SFAM (1)



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) K₂Cr₂O₇ 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 $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

m/z->	N 5 10	5.0E5	5.0E5	m/z->	5000	1.004
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		0				
		190		90		
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Part # 58024



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

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	∆ 0.2	40.02	40.02	40,02	40.02	40.02	40.02	THE PARTY OF THE P	by ICP-M	
	Sc	Sm	잗	공	Rh	æ	Pr		S (Hi	5
	<0.02	<0.02	<0.02	40.02	40,02	40.02	<0.02		g/mL)	
	Ta	S	ñ	Z.	Ą	Si.	Se			
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	==	Sn	Tm	3	ᄇ	급	176			
	40,02	40.02	40,02	40,02	<0.02	40,02	<0.02	Contract Contraction		
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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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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com



Certified Reference Material CRM

M5697 B: 10/27/23

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

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

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

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	Ľ	<u>в</u>	Ве	Ва	As	Sb	Δ		
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	Au	Š.	Ç	වූ	멸	य	Dy		
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1.1

Physical Characterization:

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

Certifled by:

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ırt # 58029

2 of 2

800-368-1131 Absolute Standards, Inc.

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CERTIFIED WEIGHT REPORT



Certified Reference Material CRM

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

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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	Sc	Sm	Ŗ.	Rb	Rh	Re	P		S (Hi	,
	40.02	40.02	<0.02	∆ 0.02	40.02	40,02	<0.02		g/mL)	
	Ta	Ø	Sr	Z	Ag	S:	%			
	40,02	40,02	40.02	∆ 0.2	40.02	<0.02	<0.2			
	11	Sn	Im	Ħ	∄	7	4.			
	40.02	40,02	40,02	40.02	<0.02	40.02	<0.02			
	Zr	Z	Υ	۲ ۵	<	4	W	STANDARD STANDARD		
	<0.02	40.02	<0.02	<0.02	40.02	<0.02	<0.02			

(I) = larget analyte

Physical Characterization:

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

Certified by:

2 of 2

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Certified Reference Material CRM



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

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

24002546 Nitric Acid

2.0%

Nominal Concentration (µg/mL):

NIST Test Number:

BTU₉ 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

Expiration Date:

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

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





800-368-1131



Certified Reference Material CRM

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

							Trace M	etals	Verificat	cation	by ICP-M	(J) SI	ua/mL)						
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Ba	<0.02	ర	<0.02	3	<0.02	ㅂ	40.02	Mn	<0.02	2	<0.02	8	<0.02	Z	40.2	Ħ	<0.02	2	<0.02
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æ	<0.02	ರೆ	<0.02	Au	<0.02	£	40.02	PK	<0.02	M	<0.2	S	40.02	Ta	<0.02	F	<0.02	Z	40.02

(T) = Target analyte

Physical Characterization:

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

Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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122



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

CERTIFIED WEIGHT REPORT:

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

Salvents: 21110221

Nitric Acid Hydrochloric acid

Lot #

22D0562008

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

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

RM#

Number

Conc. (µg/mL) Nominal

(%)

Uncertainty Assay
Purity (%) (%)

Weight (g)

Target

ρţ

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> 10.0 30.0

3 6%

Nitric Acid

Formulated By:

Benson Chan

071123

Hydrochloric acid

Reviewed By:

Pedro L. Rentas

071123

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

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

Part # 57050



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

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

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(I) = larget analyte

Physical Characterization:

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

Certified by:

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

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* 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).

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Certified Reference Material CRM

R: 02109124





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

						TANK BURNE	10000	CHICAGO CONTROL CONTRO	URCH LABILLY	ianioc)	(Solvent Safety Into, On Attached pg.)	ttacned 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		- 5
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Lot # 091923

250

240

230

220

010

W/Z->

Certified Reference Material CRM





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

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

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(T)= Target analyte

Physical Characterization:

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



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



Lot # 091923

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02/00/24 Certified Reference Material CRM

W 580



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

1. Arsenic (As)

58133

020522

0.1000

400.0

0.084

1000

10001.0

1000.0

2.0

7440-38-2

0.5 mg/m3

orl-rat 500 mg/kg 3103a

Number Part

Number Lot

Vol. (mL)

Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/ml.) Uncertainty Expanded

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

LD50

NIST SRM

SDS Information

111323

111323

Dilution Factor

initial

Uncertainty

Nominal

Initial

Final

Compound

Volume shown below was diluted to (mL):

4000.0

0.06

Flask Uncertainty

m/z->	500	1000	N is m 4	m/z-y 5.0E4	1.025	2.0E5
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Part # 57033

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

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Physical Characterization:

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Certified Reference Material CRM

R102109124

MURIC

Solvent: 21110221

Nitric Acid

Lot #

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

CERTIFIED WEIGHT REPORT:

Part Number: **Lot Number:**

57115 041723

Description:

Phosphorous (P)

Expiration Date:

041726

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

BTUB

5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 2000.02

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

1. Ammonium dihydrogen phosphate (P)

IN008 PV082019A1

10000

99,999

0.10

27.5

RM#

Compound

22%

40.0

Nitric Acid

Formulated By:

Lawrence Barry

041723

into

Reviewed By:

Pedro L. Rentas

Expanded SDS Information 041723

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

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

Part # 57115

1 of 2

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.

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2 of 2

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Certified Reference Material CRM

109/24

M5817

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 071123 57116

Solvent:

071123

ASTM Type 1 Water

Burense

Formulated By:

Lawrence Barry

071123

Lot #

Expiration Date: Description: 071126 Sulfur (S)

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

Recommended Storage:

EU1B

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

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

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

Expanded

071123

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

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

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:

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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 ₃)	≤ 0.003 %	< 0.001 %
ACS - Phosphate (PO ₄)	≤ 5 ppm	< 5 ppm
Sulfate (SO ₄)	≤ 0.004 %	< 0.004 %
Barium (Ba)	Passes Test	Passes Test
ACS - Heavy Metals (as Pb)	≤ 5 ppm	< 5 ppm
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 M5942

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 ± 5 µg/mL

Density:

1.012 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

1002 ± 4 µg/mL

ICP Assay NIST SRM 3162a Lot Number: 130925

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

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

Page 1 of 4

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

	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	М	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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 47.87 +4 6 Ti(F)6-2 Chemical Compatibility - Soluble in concentrated HCl, HF, H3PO4 H2SO4 and HNO3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF.

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 17, 2022

11.0

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

 Sealed TCT Bag Open Date: 	
---	--

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

2009784.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certified Reference Material CRM

Lot #

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

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

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

								Ггасе Ме	tals	Verifica	tion	by ICP-I	Sh (μg/mL)						
>	1		1	40.02	Dy	<0.02	HH.	<0.02	11	<0.02	Z.	T	Pr	<0.02	Se	<0.2	4T	<0.02	*	<0.02
Sb	6 <0.02	2 Ca		<0.2	퍾	<0.02	Но	<0.02	Ē	<0.02	\$	<0.02	Re	40.02	S:	<0.02	Te	<0.02	ď	40.02
≥			_	<0.02	臣	<0.02	F	<0.02	Mg	40.01	ဝွ	<0.02	R.	<0.02	Ag	<0.02	∄	<0.02	<	40.02
Ba				<0.02	වු	<0.02	۲	<0.02	M	<0.02	Pd	<0.02	RЪ	<0.02	Na.	40.2	Ħ	<0.02	\$	40.02
Ве	_			<0.02	G	<0.02	Fe	<0.2	Hg	40.2	Þ	<0.02	Ru	40.02	S.	<0.02	Tm	<0.02	×	40.02
Bi				<0.02	දු	<0.02	La	<0.02	Mo	<0.02	¥	<0.02	Sm	40.02	S	<0.02	Sn	<0.02	Zn	40.02
В	H		r	<0.02	Au	<0.02	Pв	<0.02	M	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	11	<0.02	Zr	<0.02
										(T) - Towas analys		that								

= larget analyte

Physical Characterization:

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

Certified by:

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

^{*} All standard containers are meticulously cleaned prior to use.

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

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

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

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

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



Certified 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			4		ω	3.702	0.1000	Factor	Dilution	2000.07			<u>೦</u>		Se)		
230			130		90	sec]:58	200.0	Val. (mL	Initial	0.100	5E-05						
240			140		40	33.702 sec]:58034.D# [Count] [Linear]	0.084	Vol. (mL) Pipette (mL) Conc. (µg/mL)	Uncertainty	Flask Uncertainty	Balance Uncertainty						
250			150		50	Count) [L	1000	Conc. (µg/mL)	Nominal	ťγ	ainty			2.0%	24007540	24002546	
260			160		. 60	inear 2	10002.5	Conc. (µg/mL	Initial				(mL)	40.0	No.	Solvent:	
0							1000.0	Conc. (µg/mL) Conc. (µg/mL)	Final					Nitric Acid			(1)
			170		70		2.2	.) +/- (µg/mL)	Uncertainty	Expanded	Reviewed By:	K	N	Formulated By:	M		10
			180		80		7782-49-2	C	(So		y:	200	11	Ву:			
			190		90		2 0.2 mg/m3	OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)	SDS Information	Pedro L. Rentas	leenes		Benson Chan	M		
			200		100			NA)). On Atta	rmation	ntas	,	/	5			
			-		J		orl-rat 6700 mg/kg	LDS0	ched pg.)		060624			060624			
							3149	SRM	TSIN		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).



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

info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGMO1

Lot Number:

T2-MO720876

Matrix:

H2O

tr. NH40H

Value / Analyte(s):

1 000 µg/mL ea:

Molybdenum

Starting Material:

Ammonium Molybdate

Starting Material Lot#:

2361

Starting Material Purity: 99.9893%

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Value:

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

Density:

1.000 g/mL (measured at 20 ± 4 °C)

Assav Information:

Assay Method #1

998 ± 4 µg/mL

ICP Assay NIST SRM 3134 Lot Number: 130418

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

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

Characterization of CRM/RM by Two or More Methods

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

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

X_i = mean of Assay Method : with standard uncertainty uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

u_{(s} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_a = mean of Assay Method A with

ucher a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

Chemical Compatibility -Mo is received in a NH4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-2. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the [MoO4]-2 chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH40H in a LDPE container.

Mo Containing Samples (Preparation and Solution) -Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or HCl).

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

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 95 amu	3 ppt	n/a	40Ar39K16O,79Br1
			6O,190Os2+,190Pt
			2+
ICP-OES 202.030 nm	0.008 / 0.0002 µg/mL	1	Os, Hf
ICP-OES 203.844 nm	0.012 / 0.002 μg/mL	1	
ICP-OES 204.598 nm	0.012 / 0.001 µg/mL	1	Ir, Ta

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

- 10.1 ISO 9001 Quality Management System Registration
 - QSR Certificate Number QSR-1034
- 10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"
 - Chemical Testing Accredited / A2LA Certificate Number 883.01
- 10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"
 - Reference Material Producer Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 17, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong Supervisor, Product Documentation

Meyer Trusing

Certificate Approved By:

Michael Booth Director, Technical Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Saine

CERTIFIED WEIGHT REPORT:

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



K S98 | Reference Material CRM | /24







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

		060724				060724			ached pg.) NIST	LD50 SRM	S S S S S S S S S S S S S S S S S S S	1		
	Capeate	Giovanni Esposito	2	V	lord	Pedro L. Rentas		SDS Information	(Solvent Safety Info. On Attached pg.)	OSHA PEL (TWA)				
	Lievannie		1	!	N. P.				(Solve	CAS#	13520-83-7			
	Lieva	Formulated By:			13	Reviewed By:		Expanded	Uncertainty	+/- (ug/mL)	2.5			
		Nitric Acid				1-	ij		Final	Conc. (ug/mL)	1000.0			
Solvent:	Nitric Acid	40.0	(mf.)						Initial	Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL)	10001.5		near]	
Lot #	24002546	2.0%				sinty			Nominal	Conc. (ug/mL)	1000		2.D# [Count] [Linear]	
0						Balance Uncertainty	Flask Uncertainty		Uncertainty	Pipette (mL)	0.084		92.D# [c	
KI U						5E-05	0.100		Initial	Vol. (mL)	200.0		sec]:570	
	=	3		(၃			2000.07		Dilution	Factor	0.1000		[23.254 sec]:5709	
	57092 060724 Uranium (11)		060727	Ambient (20 °C)	1000	6UTB	d to (mL):		Lot	Number	58192 041524			
			**	- 24	<u></u>	:-	was dilute		Part	Number	58192		trum N	
CERTIFIED WEIGHT REPORT:	Part Number: Lot Number: Description:		Expiration Date:	Recommended Storage:	Nominal Concentration (µg/mL):	NIST Test Number:	Volume shown below was diluted to (mL):			Compound	1. Uranyl nitrate hexahydrate (U)		[1] Spectrum No.1	

1.0E6	5.0E5	m/z-> 5.0E4	2.5E4	m/z-> 1.0E6	S.OES	\.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
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Lot # 060724





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

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

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(µg/mL)	Pr
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	B Ba Ba

(T) = Target analyte

Physical Characterization:

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





2 of 2

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

All standard containers are meticulously cleaned prior to use.

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

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

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

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

Sulfuric Acid
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis
Low Selenium





Material No.: 9673-33

Batch No.: 23D2462010 Manufactured Date: 2023-03-22

Retest Date: 2028-03-20

Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS - Assay (H2SO4)	95.0 - 98.0 %	96,1 %
Appearance	Passes Test	Passes Test
ACS - Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS - Substances Reducing Permanganate (as SO2)	≤ 2 ppm	< 2 ppm
Ammonium (NH ₄)	≤ 1 ppm	1 ppm
Chloride (CI)	≤ 0.1 ppm	< 0.1 ppm
Nitrate (NO ₃)	≤ 0.2 ppm	< 0.1 ppm
Phosphate (PO ₄)	≤ 0.5 ppm	< 0.1 ppm
Trace Impurities – Aluminum (AI)	≤ 30.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 4.0 ppb	< 2.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	8.5 ppb
Trace Impurities – Cadmium (Cd)	≤ 2.0 ppb	< 0.3 ppb
Trace Impurities - Chromium (Cr)	≤ 6.0 ppb	< 0.4 ppb
Trace Impurities - Cobalt (Co)	≤ 0.5 ppb	< 0.3 ppb
Trace Impurities - Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities - Gold (Au)	≤ 10.0 ppb	0.5 ppb
Heavy Metals (as Pb)	≤ 500.0 ppb	< 100.0 ppb
Trace Impurities - Iron (Fe)	≤ 50.0 ppb	1.3 ppb
Trace Impurities - Lead (Pb)	≤ 0.5 ppb	< 0.5 ppb
Trace Impurities - Magnesium (Mg)	≤ 7.0 ppb	0.8 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities - Nickel (Ni)	≤ 2.0 ppb	0.3 ppb
Trace Impurities – Potassium (K)	≤ 500.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se)	≤ 50.0 ppb	< 0.1 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	31.5 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb

>>> Continued on page 2 >>>

Sulfuric Acid BAKER INSTRA-ANALYZED® Reagent For Trace Metal Analysis Low Selenium





Material No.: 9673-33 Batch No.: 23D2462010

Test	Specification	Result
Trace Impurities - Sodium (Na)	≤ 500.0 ppb	5.4 ppb
Trace Impurities – Strontium (Sr)	≤ 5.0 ppb	< 0.2 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	0.4 ppb

For Laboratory, Research, or Manufacturing Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC





Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 **ACCREDITATION / REGISTRATION**

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

IV-STOCK-12

Lot Number:

U2-MEB734294

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

10 µg/mL ea:

Barium, Bismuth, Cobalt, Lithium.

Lead,

Beryllium, Cerium, Indium,

Nickel. Uranium

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

Density: 1.025 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u_{char a} = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 21, 2023

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

 Sealed TCT Bag Open Date 	o:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Paul R. Simo

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

19 R19/30

4

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

F71/2	5,027	m/z->>	\$.0E7		5.OF5	1.0M0	Zirconyl chloride octahydrate (Zr)	Compound	Volume s	Hecommended Storage: Nominal Concentration (µg/mL): NIST Test Number:	, E		CERTIFIED WEIGHT REPORT:
N 10		110		10		[1] Spectrum No.1			Volume shown below was diluted to (mL):	Hecommended Storage: I Concentration (μg/mL): NIST Test Number:	Expiration Date:	Lot Number: Description:	
		Ü				Ž	58140	Part	as dilute				
1		120		20		7	070621	Lot	d to (mL):	Ambient (20 °C) 1000	071426	071423 Zirconium (Zr)	7040
		130		30		1.163	0.1000	Dilution	2000.02	Ô		Zr)	
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		170		70			1000.0	Final Conc. (µg/mL)			Nitric Acid		,
				Ü			2.2	Expanded Uncertainty +/- (µg/mL)	neviewed by:	M	Formulated By:		3
		180		80			13520-92-8	(Solv CAS#		N.) À		
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https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

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

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Physical Characterization:

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

Certified by:

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

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

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

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



Certified Reference Material CRM



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

m/z->	1.0 m 4	1000	m/z-> 2000	6.0E6	1.0E8	Compound RM# Number 1. Magnesium nitrate hexahydrate (Mg) IN030 маровгогаал	Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	Expiration Date:	Par Lo
N 10			ō		[1] Spectrum No.1	nydrate (Mg)	NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Expiration Date: nended Storage:	Part Number: Lot Number: Description:
					3 Z 0	RIM# Nu NO30 MGD0	10000 6UTB diluted to (mi	112 Ami	112 Ma
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ļ. 	130		30		9.923	Nominal Conc. (µg/mL) 10000	2000.07	0	IPM TO
					ec];581	(%) (%) Purity (5E-05 B	9	5
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			70		Count	Assay (%) v	ainty ity	2%	vent: 2
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					on-rat 5440 mg/kg 3131a	рд.) Ш50	112124	112124	

Part # 58112

1 of 2

www.absolutestandards.com

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

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707	3	40.02	<0.02	<0.02	40.02	20.02	0.00	2000		oy ICP-N	
oc.	2	Sm	Ru	Rb	Z.	, K	1	Pr		SU	,
70.02	3	40.02	<0.02	<0.02	40.02	20.02	6 6 6	2000		g/mL)	
24	3	(A)	Sr	2	Ag	- 2	2 8	S			
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ŀ	:1	Sn	Tm	15	=	3 ;	7	75			
10101	A 3	<0.02	40.02	20.02	\$0.02	3 6	3	40.02			
	7,	Zn	-	10	\$ <	4 6	= 1	¥	100		
	A) ()2	<0.02	40.02	20.02	600	000	2000	<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

www.absolutestandards.com

Part Number:

Lot Number:



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

CERTIFIED WEIGHT REPORT:

Formulated By: Diovannie Giovanni Esposito 2 Septe 101124

Pedro L. Rentas

101124

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

Manganese (Mn)

Ambient (20 °°)

Manganese (20 °°) 1000

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

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/ml.)

+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM NIST T SDS Information

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

m/z->	5.0E7	1.0E8	5.0E7	1.0E8	7-2/2	N UI	5. OE6
							[1] 8
0		110			0		[1] Spectrum No.1
			•				NO.1
N N O		120			0		و
230		100			30		243
ō		Ō					ec]:57(
N 40		140			40		[34.243 sec]:57025.D# [Count] [Linear]
,							[Coun
N D		150			6		t] [Line
N O		300			0		2
J		J					
		170			70		
		-			Ó		
		0			80		
		90			0		
		N 0	on.		100		



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

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

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

(T) = Target analyte

Physical Characterization:

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

Certified by:

Jon T. Mills

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



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M6137

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGSI1

Lot Number:

V2-SI744713

Matrix:

tr. HNO3

tr. HF

Value / Analyte(s):

1 000 µg/mL ea:

Silicon

Starting Material:

Silica

Starting Material Lot#:

1771

Starting Material Purity:

99.9981%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

999 ± 6 µg/mL

Density:

1.003 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

999 ± 5 µg/mL

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

Assay Method #2

1000 ± 7 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

k = coverage factor = 2

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

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

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

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

X, = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

M	Ag	<	0.000310	M	Eu	<	0.000310	0	Na		0.001656	M	Se	<	0.022000	М	Zn	<	0.002500
M	Al		0.010787	М	Fe	<	0.027000	М	Nb	<	0.001300	s	Si	<		0	Zr	<	0.001900
М	As	<	0.001900	M	Ga	<	0.001300	M	Nd	<	0.000310	М	Sm	<	0.000310				
М	Au	<	0.000910	M	Gd	<	0.000310	M	Ni	<	0.005500	М	Sn		0.000096				
M	В		0.016180	M	Ge	<	0.001900	M	Os	<	0.000610	0	Sr		0.000092				
M	Ba		0.000096	M	Hf		0.000423	i	Р	<		M	Ta		0.002542				
0	Be	<	0.000570	M	Hg	<	0.000610	M	Pb	<	0.000310	М	Tb	<	0.000310				
M	Bi	<	0.000310	М	Но	<	0.000610	M	Pd	<	0.000610	M	Te	<	0.000910				
0	Ca		0.011557	M	ln	<	0.000310	M	Pr	<	0.000310	М	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	M	Rh	<	0.000310	М	U	<	0.000310				
М	Cs	<	0.000310	M	Lu	<	0.000310	M	Ru	<	0.000310	0	V	<	0.001300				
М	Cu	<	0.002500	0	Mg		0.001348	0	S	<	0.570000	М	W	<	0.001900				
M	Dy	<	0.000310	М	Mn	<	0.002500	M	Sb	<	0.000310	M	Υ	<	0.000310				
М	Er	<	0.000310	M	Мо	<	0.000310	0	Sc	<	0.000590	M	Yb	<	0.000310				

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

6.0 **INTENDED USE**

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

QUALITY STANDARD DOCUMENTATION 10.0

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 10, 2024

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0 Certificate 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



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

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

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

1 of 2



www.absolutestandards.com

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

8	В	Be	Ba	As	Sb	<u>></u>		1
<0.02	<0.02	40.01	<0.02	40.2	<0.02	<0.02		
υ	ဂ္ဂ	Ω	Č	င္ပ	ූ	Ω		
<0.02	<0.02	<0.02	40.02	<0.02	40.2	<0.02		
Au	င္ပ	ଦ୍ଧ	<u>원</u>	Eu	ম্র	Дy		١
<0.02	<0.02	<0.02	40.02	△0.02	△0.02	<0.02		
Pb	L	Fe	片	In	Но	Нf		١
<0.02	40.02	40.2	<0.02	<0.02	<0.02	<0.02	I race M	
Nd	Mo	Hg	Mn	M	달	Ш	etais	
40.02	<0.02	40.2	<0.02	<0.01	<0.02	<0.02	verilica	
×	7	Þ	Pd	ô	ğ	Z	COST	
40.2	<0.02	40.02	△0.02	40.02	<0.02	40.02	של וכד-וי	
Sc	Sm	Ru	Rb	Rh	Re	Pr	NO CH	
<0.02	<0.02	<0.02	<0.02	<0.02	40.02	<0.02	9/1111/	
Ta	Ç2	Sr	Z	Age	S	Se.		
<0.02	<0.02	△0.02	Т	<0.02	<0.02	40.2		
11	Sn	Tm	H	1	Te	4T		
40,02	40.02	<0.02	<0.02	<0.02	<0.02	<0.02		
122	Zn	×	\$	<	C	W		
<0.02	40.02	<0.02	<0.02	<0.02	<0.02	<0.02		

(T) = Target analyte

Physical Characterization:

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

Certified by:

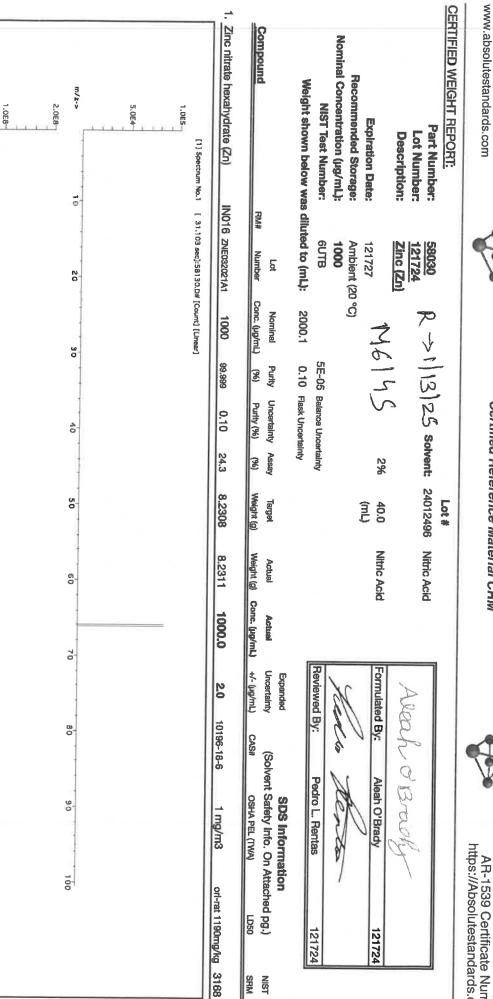
- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- All standard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



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



NIST SRM

m/z->

210

220

230

240

250

260

m/z->

110

120

130

140

50

160

170

180

190

200

1.0E8

5.0E7



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

			20.02	ra	20.02	30	702	7	40.02	Z	<0.02	P	№ 0.02	Au	40.02	5	40.02	00
7,		1	3	7	3	2			0 60	240	10.04	La	70.02	CC	20.02	S	20.02	<u>5</u>
107		Sn	20:02	v.	<u>A</u> .02	Sm	8	¥	A 23	5	3	3	3	2	3	3	5	1
7,		2		>		1	40.00	-	10.6	27.7	10.4	70	20.02	Ca	20.02	Z.	10.0	Be
ped		B	20.02	S	A) (72	Z ::	3	0	3	5	5	5	3	>		2		
9 6	000	1	, é	TVG	20.05	NO	20.02	Pa	20.02	Mn	<0.02	H	40.02	2	0.02	င္တ	40.02	Ba
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_			20.02	Ag	40.02	25	A .02	ွ	A) ()	× ×	3	3	3	Į.	3	3	3	-
<		3	23		0.00	1	40.00	540	10.04	F	20.02	HO	20.02	Ħ	4.0	Ca	<0.02	S
		Te	A 0.03	S	A (2)	200	3	<u> </u>	3	<u> </u>	3	5	5	1		1	200	1
: :			104	26	20.02	7	70.02	2	20.02	<u> </u>	<0.02	Ħ	<0.02	Dy	0.02	2	40.02	Δ]
8)	200	Ca	2000		5											
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										0.000	1100011							
					0	S U C	DV C		Verifica	S IN I	I TACO V							
					1													

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

Part # 58030



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) K₂Cr₂O₇ and 5% (v/v) nitric acid.

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K₃Fe(CN)₈, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

	ICV5-0415	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 ₄)	≤ 0.5 ppm	< 0.5 ppm
Sulfate (SO ₄)	≤ 0.05 ppm	< 0.03 ppm
Sulfite (SO₃)	≤ 0.5 ppm	< 0.3 ppm
Ammonium (NH ₄)	≤ 0.8 ppm	0.3 ppm
Trace Impurities - Arsenic (As)	≤ 3 ppm	< 1 ppm
Trace Impurities – Aluminum (AI)	≤ 0.010 ppm	< 0.003 ppm
Arsenic and Antimony (as As)	≤ 10.0 ppb	1.3 ppb
Trace Impurities - Barium (Ba)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities - Beryllium (Be)	≤ 1.0 ppb	0.2 ppb
Trace Impurities - Bismuth (Bi)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Boron (B)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 20.0 ppb	< 5.0 ppb
Trace Impurities - Calcium (Ca)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities - Calcium (Ca) Trace Impurities - Chromium (Cr)	≤ 50.0 ppb	163.0 ppb
Trace Impurities - Cobalt (Co)	≤ 1.0 ppb	0.7 ppb
	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities - Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities - Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Frace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Frace Impurities – Gold (Au)	≤ 4.0 ppb	0.6 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Frace Impurities – Iron (Fe)	≤ 15 ppb	6 ppb

>>> Continued on page 2 >>>

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





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

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

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





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

Test

Specification

Result

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

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





Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

R→1/7/23 M6153 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:

CGSR10

Lot Number:

V2-SR745329

Matrix:

2% (v/v) HNO3

Value / Analyte(s):

10 000 μg/mL ea:

Strontium

Starting Material:

Strontium Carbonate

Starting Material Lot#:

2647

Starting Material Purity:

99.9960%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

 $10081 \pm 39 \mu g/mL$

Density:

1.030 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

10059 ± 50 μg/mL

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

Assay Method #2

10087 ± 26 µg/mL

EDTA NIST SRM 928 Lot Number: 928

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{\gamma_2}$ where u_{char} i are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

X_a = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

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

 $\mathbf{u}_{\mathbf{b}\mathbf{b}}$ = 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.

М	Ag	<	0.000960	М	Eu	<	0.000480	0	Na		0.002964	М	Se	<	0.042000	М	Zn	0.004560
М	Αl		0.003420	0	Fe		0.013225	М	Nb	<	0.000480	0	Si		0.012997	М	Zr	0.001847
М	As	<	0.007200	М	Ga	<	0.002900	М	Nd	<	0.000480	M	Sm	<	0.000480			
М	Au	<	0.003900	М	Gd	<	0.000480	0	Ni		0.001482	M	Sn	<	0.000480			
0	В	<	0.003200	М	Ge	<	0.004800	М	Os	<	0.001500	s	Sr	<				
М	Ba		0.638494	М	Hf	<	0.000480	0	Р	<	0.017000	M	Ta	<	0.000480			
0	Be	<	0.000450	М	Hg	<	0.000960	М	Pb		0.010717	М	Tb	<	0.000480			
M	Bi	<	0.002000	M	Но	<	0.000480	M	Pd	<	0.002000	М	Te	<	0.016000			
0	Ca		0.025083	M	In	<	0.008600	M	Pr		0.000547	M	Th	<	0.000480			
М	Cd	<	0.000960	M	lr	<	0.000480	М	Pt	<	0.000480	M	Ti		0.004560			
M	Ce		0.000661	0	K		0.025083	М	Rb	<	0.003400	M	ΤI	<	0.000480			
M	Co		0.001527	М	La	<	0.000480	М	Re	<	0.000480	М	Tm		0.004332			
0	Cr	<	0.004700	0	Li	<	0.005600	0	Rh	<	0.013000	М	U	<	0.000480			
М	Cs	<	0.000480	М	Lu	<	0.000480	М	Ru	<	0.000960	М	V	<	0.000960			
0	Cu	<	0.003800	0	Mg		0.001048	0	S	<	0.045000	M	W	<	0.002400			
М	Dy	<	0.000960	0	Mn		0.000319	М	Sb	<	0.009600	0	Υ	<	0.001200			
M	Er	<	0.000480	M	Мо	<	0.002900	M	Sc	<	0.001500	M	Yb	<	0.000480			

M - Checked by ICP-MS

O - Checked by ICP-OES

i - Spectral Interference

n - Not Checked For s - Solution Standard Element

6.0 **INTENDED USE**

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

Atomic 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	Ce

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 26, 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 26, 2029
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:	

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong

Custom Processing Supervisor

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Mayyand Kha Paul R. Laine





R-02/02/2025

M-6158

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

Manufactured Date: 2024-03-26

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

Certificate of Analysis

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

>>> Continued on page 2 >>>





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

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

Nitric Acid 69% **CMOS**





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

Test Specification Result

For Microelectronic Use

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

Jamie Croak Director Quality Operations, Bioscience Production



Certificate of Analysis
M5738 M5739 M5740 M5741 M5742

Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 **ACCREDITATION / REGISTRATION**

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



2.0 **PRODUCT DESCRIPTION**

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

6020ISS

Lot Number:

S2-MEB709511

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

10 µg/mL ea:

Bismuth,

Holmium,

Indium,

6-Lithium.

Rhodium,

Scandium,

Terbium,

Yttrium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE 6-Lithium, Li6 **CERTIFIED VALUE** $10.00 \pm 0.03 \,\mu g/mL$

ANALYTE

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

Bismuth, Bi

Indium, In

10.00 ± 0.04 µg/mL

Holmium, Ho Rhodium, Rh

 $10.00 \pm 0.05 \,\mu g/mL$ 10.00 ± 0.07 µg/mL

Scandlum, Sc

10.00 ± 0.04 µg/mL

Terbium, Tb

10.00 ± 0.04 µg/mL

Yttrium, Y

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

Density:

1.035 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

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

Certified Abundance:

IV's Certified Abundance

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 03, 2021

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

11.2 Lot Expiration Date

- September 03, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRWRM can be supported by long term stability studies conducted on properly stored and handled CRWRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Both

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

RD: 07/14/2022

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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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





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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

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

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

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

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

ICSA: M5873

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

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

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

RD: 07/14/2022

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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
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(C) ANALYSIS OF SAMPLES

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

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





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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

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

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

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

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

ICSA: M5873

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

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

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

Certified Reference Material CRM

M6030



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

R = 8 | 5 | 24

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

800-368-1131

Absolute Standards, Inc.

Part Number: Solvent: 24002546 Lot # Nitric Acid

Lot Number: Description: 57047 122823 Silver (Ag)

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

Weight shown below was diluted to (mL): 4000.30

1. Silver nitrate (Ag)

IN035 J0612AGA1

1000.0

0.10

63.7

6.27992

6.27998

1000.0

2.0

7761-88-B

10 ug/m3

Z

3151

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

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

Formulated By:

Benson Chan

122823

122823

Reviewed By: Pedro L. Rentas

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

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

www.absolutestandards.com



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

Physical Characterization:

(T)= Target analyte

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

Certified by:

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

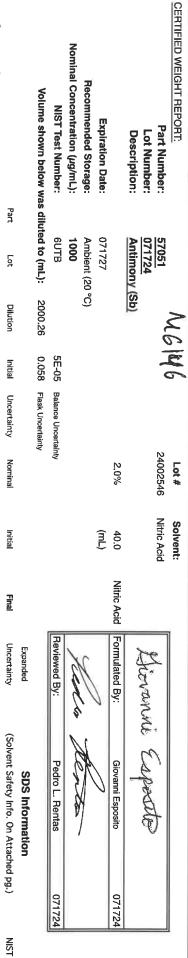
Lot # 071724

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



R:10/18/24 Certified Reference Material CRM

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



Compound

Number

Number

Factor

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

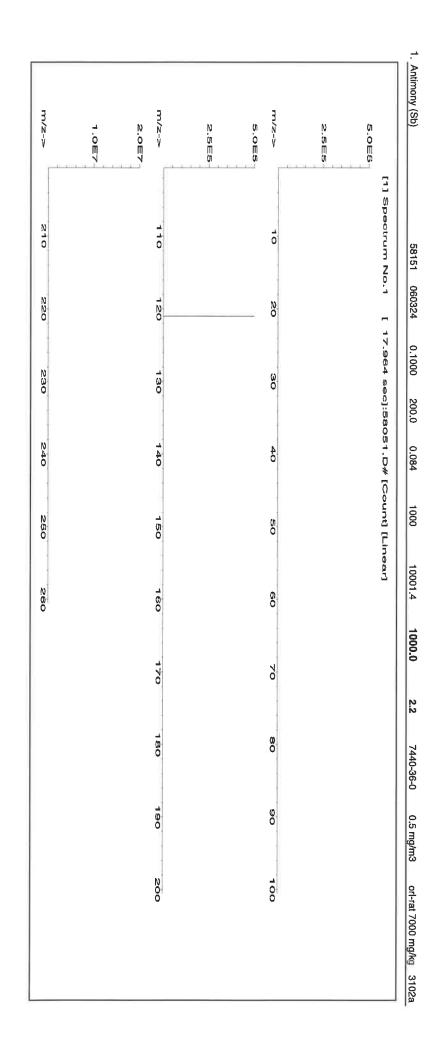
+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

SRM



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

	l		П		Н			Trace M	etals	Verifica		by ICP-M	S (µg	/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
_	Ba	<0.02	ß	<0.02	8	<0.02	lr	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Ŧ	<0.02	ΥЪ	<0.02
_	_{ве}	<0.01	다	<0.02	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).

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- 8			

Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



Certified Reference Material CRM

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



				071724				071724		
		TO SOR DE	}	Giovanni Esposito	0	M	Kento	Pedro L. Rentas		SDS Information
		Z Indania.	3	Nitric Acid Formulated By:	1	1	Medle	Reviewed By:		Expanded
				Nitric Acid						
Solvent:	Nitric Acid			40.0	(mL)					
Lot#	24002546			2.0%				Balance Uncertainty	Flask Uncertainty	
00)							5E-05	0.058	
X6/60			(Sb)			() ()			2000.26	
	57051	071724	Antimony (Sb)		071727	Ambient (20 °C)	1000	6UTB	diluted to (mL):	
CERTIFIED WEIGHT REPORT:	Part Number:	Lot Number:	Description:		Expiration Date:	Recommended Storage:	Nominal Concentration (µg/mL):	NIST Test Number:	Volume shown below was diluted to (mL):	

NIST SRM

LD50

OSHA PEL (TWA)

CAS#

+/- (µg/mL) Uncertainty Expanded

Conc. (µg/mL) Conc. (µg/mL)

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Initial

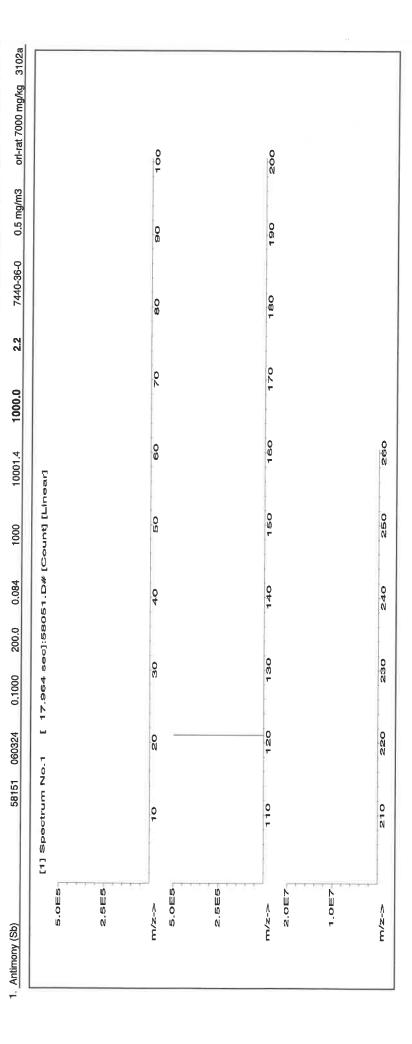
Dilution Factor

Ľ

Number Part

Compound

(Solvent Safety Info. On Attached pg.)



Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

							Trace M	etals	Verifica	tion	by ICP-M	12 (4	ug/mL)						
Ш													ш						
	<0.02	25	<0.02	Δ	<0.02	Ħ	<0.02	Li	<0.02	ï	<0.02	F	<0.02	Se	<0.2	TP	<0.02	*	<0.02
	Н	ű	<0.2	퍼	<0.02	Ho	<0.02	r,	<0.02	₽ R	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	n	<0.02
	<0.2	ඊ	<0.02	En	<0.02	Щ	<0.02	Mg	<0.01	ő	<0.02	Rh	<0.02	Ag	<0.02	F	<0.02	>	<0.02
	<0.02	స	<0.02	පි	<0.02	П	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
	<0.01	ప	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Ь	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
	<0.02	ථ	<0.02	පී	<0.02	La	<0.02	Mo	<0.02	盂	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zu	<0.02
	<0.02	Çn	<0.02	Au	<0.02	Pb	<0.02	PN	<0.02	К	<0.2	Sc	<0.02	Та	<0.02	Ξ	<0.02	Zr	<0.02

(T) = Target analyte

Certified by:

Physical Characterization:

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



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

ustry. R: 8/5/24

M6019

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Custom Grade Solution

Catalog Number:

CGSR1

Lot Number:

U2-SR730227

Matrix:

0.1% (v/v) HNO3

Value / Analyte(s):

1 000 μg/mL ea:

Strontium

Starting Material:

SrCO3

Starting Material Lot#:

M2-2192

Starting Material Purity:

99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

1001 ± 3 µg/mL

Density:

1.000 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1

998 ± 4 µg/mL

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

Assay Method #2

1001 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3

1001 ± 2 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

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

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

X_i = mean of Assay Method i with standard uncertainty uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty (stora

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

X_a = mean of Assay Method A with

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

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

М	Ag	<	0.001980	М	Eu	<	0.000495	0	Na		0.000200	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				
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M	Cd		0.001339	M	lr	<	0.000494	M	Pt	<	0.002970	М	Tī	<	0.005940				
M	Çe	<	0.004950	0	K	<	0.008184	М	Rb	<	0.002970	М	TI	<	0.000495				
M	Co	<	0.000495	M	La	<	0.000495	М	Re	<	0.000495	М	Tm	<	0.000495				
0	Cr	<	0.003207	0	Li	<	0.000884	0	Rh	<	0.012829	М	U	<	0.001485				
М	Cs	<	0.000990	M	Lu	<	0.002970	М	Ru	<	0.000989	М	٧	<	0.001980				
M	Cu		0.000099	0	Mg		0.000064	i	S	<		М	W	<	0.003960				
М	Dy	<	0.000495	0	Mn		0.000066	М	Sb	<	0.014852	0	Υ	<	0.000995				
М	Er	<	0.000495	М	Мо	<	0.001980	М	Sc	<	0.001980	М	Yb	<	0.000495				

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

6.0 INTENDED USE

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

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 03, 2023

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:	
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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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

M6023

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

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

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

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

CAS#

OSHA PEL (TWA)

LD50

SRM

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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

7/2-7	P. 58 E. 6	m/z->- 5,0E8	1.0E7	m/z-> 2.0E7	1.0厘6	2.0E6
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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).