

8900, Fax: 908 789 8922

Prep Standard - Chemical Standard Summary

Order ID: Q2842

Test: Dissolved ICP-Group2, Mercury, Metals ICP-TAL

Prepbatch ID: PB169249,PB169250,

Sequence ID/Qc Batch ID: LB136836,LB136836,LB136861,LB136861,LB136916,

Standard ID:

 $\label{eq:mp85156} MP85892, MP85893, MP85894, MP85895, MP86739, MP86740, MP86741, MP86742, MP86743, MP86744, MP86745, MP86746, MP86746, MP86747, MP86748, MP86750, MP86751, MP86770, MP86771, MP86772, MP86773, MP86774, MP86775, MP86776, MP86777, MP86778, MP86779, MP86781, MP86782, MP86783, MP86786, MP86787, MP86788, MP86789, MP86790, MP86791, MP86792, MP86793, MP86794, MP86863,$

Chemical ID:

M4371,M4465,M4916,M5062,M5245,M5305,M5658,M5697,M5798,M5799,M5800,M5801,M5815,M5817,M5884,M5962,M5979,M5981,M6021,M6023,M6025,M6026,M6027,M6028,M6030,M6032,M6041,M6055,M6058,M6079,M6086,M612,8,M6137,M6140,M6142,M6144,M6145,M6146,M6151,M6153,M6156,M6158,M6159,M6160,M6162,M6163,M6164,M6165,M6171,M6172,M6175,M6176,M6178,M6185,W3112,





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Metals STANDARD PREPARATION LOG

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
170	1:1HCL	MP85156	04/07/2025	09/06/2025	Kareem Khairalla	None	None	04/07/2025

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3965	2:1 H2SO4 : HNO3	MP85892	06/05/2025	11/27/2025	Mohan Bera	None	None	06/14/2025

FROM 1600.00000ml of M6041 + 800.00000ml of M6162 = Final Quantity: 3200.000 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
65	POTASSIUM PERMANGANATE SOLUTION 5 %	MP85893	06/05/2025	12/05/2025		METALS_SCA LE_3 (M SC-3)		06/14/2025

FROM	100.00000gram of M4916 -	- 2000.00000ml of W3112	= Final Quantity: 2000.000 ml
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Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
66	POTASSIUM PERSULFATE SOLUTION 5 %	MP85894	06/05/2025	08/31/2025		METALS_SCA LE_3 (M SC-3)		06/14/2025

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



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
67	HYDROXYL- CHLORIDE	MP85895	06/05/2025	08/31/2025		METALS_SCA LE_3 (M SC-3)		06/14/2025
	SOLUTION							

FROM	2000.00000ml of W3112	+ 240.00000gram of M4371	1 + 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)	MP86739	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	

FROM 25.00000ml of M6151 + 4925.00000ml of W3112 + 50.00000ml of M6162 = Final Quantity: 5000.000 ml



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Metals STANDARD PREPARATION LOG

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
2902	S8 ICPMS	MP86740	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	
							A)	

FROM

 $1.00000 ml \ of \ M6159 + 2.50000 ml \ of \ M6140 + 2.50000 ml \ of \ M6142 + 5.00000 ml \ of \ M6086 + 5.00000 ml \ of \ M6171 + 5.00000 ml$

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
3947	S7(SFAM,6020,200.8)	MP86741	08/12/2025	09/02/2025	Janvi Patel	None	METALS_PIP ETTE_1 (ICP	•

FROM

 $0.10000 \text{ml of M6153} + 0.40000 \text{ml of M6026} + 1.00000 \text{ml of M5799} + 1.00000 \text{ml of M5981} + 1.00000 \text{ml of M6079} + 1.00000 \text{ml of M6137} + 1.00000 \text{ml of M6159} + 10.00000 \text{ml of M5979} + 10.00000 \text{ml of M6162} + 10.00000 \text{ml of M6178} + 2.00000 \text{ml of M6178} + 2.00000 \text{ml of M6178} + 2.00000 \text{ml of M6187} + 4.00000 \text{ml of M6032} + 4.90000 \text{ml of M6140} + 4.90000 \text{ml of M6142} + 47.00000 \text{ml of M6151} + 834.10000 \text{ml of W3112} + 9.00000 \text{ml of M5697} + 9.00000 \text{ml of M6148} + 9.00000 \text{ml of M6145} + 9.90000 \text{ml of M6187} + 9.90000 \text{ml of M6187} + 9.00000 \text{ml} \text{of M6188} + 9.00000 \text{ml} \text{of M6188} + 9.90000 \text{ml} \text{of M6188} + 9.900000 \text{ml} \text{of M6188} + 9.90000 \text{ml} \text{of M6188} + 9.90000 \text{ml} \text$



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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
3948	S6(SFAM,6020,200.8)	MP86742	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	
							A)	

FROM 0.50000ml of M6151 + 1.00000ml of M6162 + 48.50000ml of W3112 + 50.00000ml of MP86741 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
3949	S5(SFAM,6020,200.8)	MP86743	08/12/2025	09/02/2025	Janvi Patel	None	METALS_PIP ETTE_1 (ICP	•

FROM 0.50000ml of M6151 + 1.00000ml of M6162 + 73.50000ml of W3112 + 25.00000ml of MP86741 = Final Quantity: 100.000 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 Sarabjit Jaswal
3954	S4(SFAM,6020,200.8)	MP86744	08/12/2025	09/02/2025	Janvi Patel	None	METALS_PIP ETTE_1 (ICP	•
							A)	-

FROM 0.50000ml of M6151 + 1.00000ml of M6162 + 86.00000ml of W3112 + 12.50000ml of MP86741 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
3951	S3(SFAM, 6020,200.8)	MP86745	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	•

FROM 0.50000ml of M6151 + 1.00000ml of M6162 + 88.50000ml of W3112 + 10.00000ml of MP86742 = Final Quantity: 100.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	NAME ICSA ICPMS	NO. MP86746	Prep Date 08/12/2025	Expiration Date 09/02/2025	Prepared By Janvi Patel	<u>ScaleID</u> None	PipetteID METALS PIP	Supervised By Sarabjit Jaswal
							ETTE_1 (ICP	
FROM	10.00000ml of M6185 + 90.00000ml	of MP86739) = Final Qua	ntity: 100.000	ml		A)	

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
1143			08/12/2025	09/02/2025	Janvi Patel		METALS_PIP	Sarabjit Jaswal
							ETTE_1 (ICP	08/14/2025

FROM 10.00000ml of M5245 + 10.00000ml of M6185 + 80.00000ml of MP86739 = Final Quantity: 100.000 ml





Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
3962	MG 10PPM FOR TUNE	MP86748	08/12/2025	08/26/2025	Janvi Patel		METALS_PIP	
							ETTE_1 (ICP	08/14/2025
FROM	0.01000ml of M6171 + 9.99000ml of	MP86739 =	= Final Quanti	ty: 100.000 ml			A)	

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
3894	TUNE 200PPB	MP86750	08/12/2025	09/02/2025	Janvi Patel	None	METALS_PIP	-
							ETTE_1 (ICP	08/14/2025

FROM 2.00000ml of M6055 + 2.00000ml of MP86748 + 96.00000ml of MP86739 = Final Quantity: 100.000 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 Sarabjit Jaswal
4213	NEW ICV-6020B	MP86751	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	•
							A)	

FROM 0.00800ml of M6163 + 0.00800ml of M6164 + 0.01600ml of M6165 + 49.96800ml of MP86739 = Final Quantity: 50.000 ml

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP86770	08/14/2025	08/15/2025	Sagar Kanani	None	METALS_PIP ETTE_5 (HG	

FROM 1.00000ml of M6162 + 2.50000ml of M5062 + 96.50000ml of W3112 = 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		
1340	Hg 0.00 PPB STD	MP86771	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG			
	A)									

FROM 2.50000ml of M6162 + 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
1341	Hg 0.2 PPB STD	MP86772	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	•

FROM 2.50000ml of M6162 + 247.30000ml of W3112 + 0.20000ml of MP86770 = Final Quantity: 250.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	NAME.	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1342	Hg 2.5 PPB STD	MP86773	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	

FROM 2.50000ml of M6162 + 245.0000ml of W3112 + 2.50000ml of MP86770 = Final Quantity: 250.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1343	Hg 5.0 PPB STD	MP86774	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	,

FROM 2.50000ml of M6162 + 242.50000ml of W3112 + 5.00000ml of MP86770 = 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 Sarabjit Jaswal
1344	Hg 7.5 PPB STD	MP86775	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	,
	0.5000015.000001.000001	-£\M0440 ·	7 500001 -4	MD00770 F	i	-0.0001	A)	

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1345	Hg 10.0 PPB STD	MP86776	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	•

FROM 2.50000ml of M6162 + 237.50000ml of W3112 + 10.00000ml of MP86770 = Final Quantity: 250.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal		
1346	Hg ICV SOLUTION	MP86777	08/14/2025	08/15/2025	Sagar Kanani	None	METALS_PIP ETTE_5 (HG			
FROM	FROM 2.50000ml of M6162 + 245.00000ml of W3112 = 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
1351	ICB (Hg 0.00 PPB SOLUTION)	MP86778	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP	
							ETTE_5 (HG	08/14/2025

2.50000ml of M6162 + 247.50000ml of W3112 = 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>PipetteID</u>	Supervised By Sarabjit Jaswal
1358	CCV (Hg 5.0 PPB SOLUTION)	MP86779	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	
							A)	

FROM 485.00000ml of W3112 + 5.00000ml of M6162 + 10.00000ml of MP86770 = Final Quantity: 500.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	By	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1352	CCB (Hg 0.00 PPB SOLUTION)	MP86781	08/14/2025	08/15/2025	Sagar Kanani	None	METALS_PIP	
							ETTE_5 (HG	08/14/2025

FROM 495.00000ml of W3112 + 5.00000ml of M6162 = Final Quantity: 500.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	MP86782	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	
	0.50000 6140400 0450000	5340440					A)	

FROM 2.50000ml of M6162 + 247.30000ml of W3112 + 0.20000ml of MP86770 = 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
1350	CHK STD (Hg 7.0 PPB SOLUTION)	MP86783	08/14/2025	08/15/2025	Sagar Kanani		METALS_PIP ETTE_5 (HG	•

FROM 2.50000ml of M6162 + 240.50000ml of W3112 + 7.00000ml of MP86770 = Final Quantity: 250.000 ml



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
104	5% RINSING HCL	MP86786	08/14/2025	08/17/2025	Sagar Kanani	None	None	08/14/2025

FROM 100.00000ml of M6151 + 1900.00000ml of W3112 = Final Quantity: 2000.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
3955	S2CONC(SFAM,6020,200.8)		08/12/2025	09/02/2025	Janvi Patel	None	METALS_PIP	
							ETTE_1 (ICP	08/18/2025

FROM

 $0.05000ml\ of\ M5798+0.05000ml\ of\ M5800+0.05000ml\ of\ M5801+0.05000ml\ of\ M5981+0.05000ml\ of\ M6023+0.05000ml\ of\ M6023+0.05000ml\ of\ M6023+0.05000ml\ of\ M6023+0.05000ml\ of\ M6079+0.05000ml\ of\ M6079+0.05000ml\ of\ M6079+0.05000ml\ of\ M6079+0.05000ml\ of\ M6079+0.05000ml\ of\ M6176+0.10000ml\ of\ M6159+0.25000ml\ of\ M6146+0.10000ml\ of\ M6159+0.25000ml\ of\ M6159+0.25000ml\ of\ M6140+0.25000ml\ of\ M6140+0.25000$



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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
3956	S2(SFAM,6020,200.8)	MP86788	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	
							A)	

FROM 0.25000ml of M6151 + 0.50000ml of M6162 + 49.00000ml of W3112 + 0.25000ml of MP86787 = 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
3957	S1(SFAM,6020,200.8)	MP86789	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	•

FROM 0.25000ml of M6151 + 0.50000ml of M6162 + 44.25000ml of W3112 + 5.00000ml of MP86788 = Final Quantity: 100.000 ml



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3880	M&B SPIKE-1	MP86790	08/12/2025	09/02/2025	Janvi Patel	None	None	08/18/2025

FROM

5.00000ml of M5658 + 5.0000ml of M5798 + 5.0000ml of M5800 + 5.0000ml of M5962 + 5.0000ml of M5981 + 5.0000ml of M6021 + 5.0000ml of M6023 + 5.0000ml of M6027 + 5.0000ml of M6028 + 5.0000ml of M6030 + 5.0000ml of M6160 + 5.0000ml of M6176 + 32.5000ml of MP86739 = Final Quantity: 100.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date		<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
3881	M&B SPIKE-2	MP86791	08/12/2025	09/02/2025	Janvi Patel	None	None	08/18/2025

FROM

10.00000 ml of M5979 + 10.00000 ml of M6178 + 12.50000 ml of M6032 + 12.50000 ml of M6140 + 12.50000 ml of M6142 + 2.50000 ml of M5799 + 2.50000 ml of M6137 + 5.0000 ml of M6159 + 32.50000 ml of MP86739 = 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
3882	M&B SPIKE-3	MP86792	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	
FROM	0.62500ml of M6026 + 12.50000ml o	f M5697 + 1	2.50000ml of	M6128 + 12.50	0000ml of M614	5 + 11.87500ml	A) of MP86739 =	=

FROM

Final Quantity: 50.000	ml		

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3900	M&B SPIKE-4	MP86793	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	•

6.25000ml of M6086 + 6.25000ml of M6171 + 6.25000ml of M6172 + 6.25000ml of MP86739 = Final Quantity: 25.000 ml **FROM**



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Metals STANDARD PREPARATION LOG

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabiit Jaswal
3961	ccv	MP86794	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	

FROM

0.20000ml of M6026 + 0.50000ml of M5799 + 0.50000ml of M5981 + 0.50000ml of M6079 + 0.50000ml of M6137 + 0.50000ml of M6176 + 1.00000ml of M5815 + 1.00000ml of M5817 + 10.00000ml of M6162 + 12.45000ml of M6140 + 12.45000ml of M6142 + 2.0000ml of M6032 + 24.95000ml of M6086 + 24.95000ml of M6144 + 24.95000ml of M6171 + 25.0000ml of M6175 + 4.50000ml of M5697 + 4.50000ml of M6128 + 4.50000ml of M6145 + 4.95000ml of M6159 + 5.0000ml of M6151 + 5.50000ml of M5979 + 5.50000ml of M6178 + 824.10000ml of W3112 = Final Quantity: 1000.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
4213	NEW ICV-6020B	MP86863	08/12/2025	09/02/2025	Janvi Patel		METALS_PIP ETTE_1 (ICP	•

FROM

0.00800ml of M6164 + 0.00800ml of M6165 + 0.01600ml of M6163 + 0.02500ml of M6058 + 0.22500ml of M6156 + 49.71800ml of MP86739 = Final Quantity: 50.000 ml



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	07/01/2019 / RICHARD	06/07/2019 / RICHARD	M4371
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 10ug/mL	S2-HG709270	09/22/2026	05/28/2022 / mohan	01/27/2022 / mohan	M5062
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSB (ICPMS) STOCK SOLUTION	CP-MS ICSB-0803	07/01/2026	07/02/2025 / jaswal	02/20/2020 / jaswal	M5245
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #



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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	060523	06/05/2026	08/28/2023 / jaswal	08/25/2023 / jaswal	M5658
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	102523	10/25/2026	04/03/2024 / jaswal	10/27/2023 / jaswal	M5697
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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 Opened /	Received Date /	Chemtech
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	071123	07/11/2026	Opened By 02/09/2024 / bin	02/09/2024 / bin	Lot # M5799
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	091923	09/19/2026	05/31/2024 / bin	02/09/2024 / bin	M5800
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57033 / As, 1000 PPM, 125 ml	111323	11/13/2026	02/09/2024 / bin	02/09/2024 / bin	M5801



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	041723	04/17/2026	05/21/2024 / Jaswal	02/09/2024 / jaswal	M5815
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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 #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000281938	07/06/2026	04/30/2024 / mohan	04/25/2024 / mohan	M5884
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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 #
Supplier Inorganic Ventures	ItemCode / ItemName CGTI1-1 / TITANIUM 125mL 1000ug/mL	Lot # T2-TI719972	-	-		
Inorganic	CGTI1-1 / TITANIUM		Date	Opened By 08/06/2025 /	Received By 02/22/2024 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	062424	06/24/2027	09/28/2024 / jaswal	08/05/2024 / Jaswal	M6021
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	0624724	06/27/2027	08/05/2024 / kareem	08/05/2024 / Jaswal	M6023
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57082 / Pb, 1000 PPM, 125 ml	061224	11/09/2026	08/05/2024 / Jaswal	08/05/2024 / Jaswal	M6025
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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.	57028 / Ni, 1000 PPM, 125 ml	062024	06/20/2027	06/04/2025 / Janvi	08/05/2024 / Jaswal	M6027
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	070124	07/01/2027	08/05/2024 / kareem	08/05/2024 / Jaswal	M6028



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	122823	12/28/2026	08/05/2024 / kareem	08/05/2024 / Jaswal	M6030
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	010924	01/09/2027	01/14/2025 / Jaswal	08/05/2024 / Jaswal	M6032
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-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 /	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	V2-MEB746173	01/29/2026	01/29/2025 / JANVI	08/22/2024 / Jaswal	M6058
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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.	58025 / Mn, 1000 PPM, 500 ml	101124	10/11/2027	01/13/2025 / kareem	01/13/2025 / kareem	M6128
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	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 /	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	011025	01/10/2028	06/25/2025 / Janvi	01/13/2025 / Jaswal	M6140
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	103024	10/30/2027	05/06/2025 / JANVI	01/13/2025 / Jaswal	M6142
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute	58111 / Na, 10000 PPM,	072424	07/24/2027	01/23/2025 /	01/13/2025 /	M6144



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	121724	12/17/2027	02/04/2025 / jaswal	01/13/2025 / Jaswal	M6145
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	071724	07/17/2027	01/31/2025 / kareem	10/18/2024 / kareem	M6146
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22G2862015	02/17/2026	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 #
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	032123	03/21/2026	11/06/2024 / JANVI	06/12/2024 / JANVI	M6156
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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	071724	07/17/2027	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	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24H0162012	11/27/2025	05/27/2025 / Sagar	04/27/2025 / Sagar	M6162
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	QCP-CICV-1-125ML / EPA CLP ICP Verification Standard1	V2-MEB744107	06/08/2026	06/09/2025 / jaswal	06/06/2025 / jaswal	M6163
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier Inorganic Ventures	ItemCode / ItemName QCP-CICV-2-125ML / EPA CLP ICP Verification Standard2	Lot # U2-MEB733713	-	=		
Inorganic	QCP-CICV-2-125ML / EPA CLP ICP Verification		Date	Opened By 06/09/2025 /	Received By 06/09/2025 /	Lot #



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	011525	01/15/2028	07/15/2025 / jaswal	02/13/2025 / Janvi	M6171
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGNA10-5 / Sodium, 500 ml, 10000 PPM	V2-NA740547	07/29/2026	07/29/2025 / Janvi	01/25/2025 / Janvi	M6172
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	6020CAL-1 / Calibration Standard Method 6020	V2-MEB742014	07/17/2026	07/17/2025 / Janvi	01/27/2025 / Janvi	M6175
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	092724	09/27/2027	08/06/2025 / Janvi	08/06/2025 / Janvi	M6176
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier Absolute Standards, Inc.	ItemCode / ItemName 57042 / Mo, 1000 PPM, 125 ml	Lot # 080528	-	-		
Absolute	57042 / Mo, 1000 PPM,		Date	Opened By 08/06/2025 /	Received By 08/06/2025 /	Lot #



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



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

R1815/24

CERTIFIED WEIGHT REPORT: 1. Barium nitrate (Ba) Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: IN023 BAD022019A1 RV# 57056 010924 Barium (Ba) **6UTB** 1000 Ambient (20 °C) 010927 Number Pot Conc. (µg/mL) 2000.02 Nominal 1000 0.058 Flask Uncertainty 99.999 5E-05 Balance Uncertainty Purity Uncertainty Assay 3 Purity (%) 0,10 Solvent: 24002546 52.3 8 2% Weight (g) 3.82417 Target Lot # 40.0 Nitric Acid Weight (g) Conc. (µg/mL) 3.82441 Nitric Acid Actual 1000.1 Actual +/- (µg/mL) Reviewed By: Formulated By: Uncertainty Expanded Giovannie 2.0 10022-31-B CAS# (Solvent Safety Info. On Attached pg.)
OSHA PEL (TWA) LD50 Giovanni Esposito Pedro L. Rentas であるとん SDS Information 0.5 mg/m3 orl-rat 355 mg/kg 3104a 010924 010924 NIST SRM

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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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Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se Ca T Er 40.02 Ho 40.02 Lu 40.02 Nb 40.02 Pr 40.02 Si Ce 40.02 Bu 40.02 Ir 40.02 Mg 40.01 Os 40.02 Rb 40.02 Ag Cs 40.02 Gd 40.02 Ir 40.02 Mn 40.02 Pd 40.02 Na Cr 40.02 Ga 40.02 Ir 40.02 Mg 40.02 Pd 40.02 Rb 40.02 Na Cr 40.02 Ga 40.02 Fe 30 Hg 40.2 P 40.02 Ru 40.02 Sr Cr 40.02 Gu 40.02 Ph 40.02 Sr 40.02 Sr 40.02 Sr 40.02 Sr 40.02
A0.02 Dy A0.02 Hf A0.02 Li A0.02 Ni A0.02 Fr A0.02 Si
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Hf <0.02 Li <0.02 Ni <0.02 Re <0.02 Ni <0.02 Rh <0.02 Ni <0.02 Rh <0.02 Ni <0.02 Ni
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Φ0.02 Ni Φ0.02 Pr Φ0.02 Se Φ0.02 Nb Φ0.02 Re Φ0.02 Si Φ0.01 Os Φ0.02 Rb Φ0.02 Ag Φ0.02 Pd Φ0.02 Rb Φ0.02 Na Φ0.02 Pr Φ0.02 Sm Φ0.02 Sr Φ0.02 Fr Φ0.02 Sr Φ0.02 Ta
Tication by ICP-MS (µg/mL) 02 Ni <0.02 Pr <0.02 Se 02 Nb <0.02
They ICP-MS (µg/mL) 1
40.02 Pr < 40.02 Se < 40.02 Rb < 40.02 Na < 40.02 Sr < 40.02 Ta
9/mL) 40.02 Se 40.02 Si 40.02 Ag 40.02 Na 40.02 Sr 40.02 Sr 40.02 Ta
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2 2 x 2 < c <
40.92 40.92 40.92 40.92 40.92

(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).

Absolute Standards, Inc. 800-368-1131

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Certified Reference Material CRM

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number:

R 815/24

Solvent: 24002546 Lot # Nitric Acid

Description: 57048 070124 Cadmium (Cd) 2%

40.0 (mL)

Nitric Acid

Formulated By:

Aleah O'Brady

070124

Alban PROBAN

Nominal Concentration (µg/mL): Recommended Storage: NIST Test Number: **Expiration Date:** 6UTB 1000 070127 Ambient (20 °C)

Weight shown below was dliuted to (mL): Lot 2000.07 Nominal 0.100 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Reviewed By: Expanded Pedro L. Rentas **SDS Information** 070124

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

 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

5.0M4 [1] Spectrum No.1 [12.514 sec]:58148.D# [Count] [Linear]

Weight (g) Weight (g) Conc. (µg/mL) Actual Actual Uncertainty

+/- (µg/mL)

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

CAS# **NIST** SRM

Certified Reference Material CRM



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

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

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	<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:

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



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

Instructions for QATS Reference Material: 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 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.

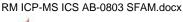
QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY
APTIM Federal Services, LLC
2700 Chandler Avenue - Building C
Las Vegas, NV 89120

(C) ANALYSIS OF SAMPLES

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:

M5245

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: M5244

	Table 1.		VALUES" FOR 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	[100000]			[100000]		
Sb	2.0	(1.5)	-2.5	5.5	(22.0)	18.0	26.0
As	1.0	(0.10)	-1.9	2.1	19.0	16.2	21.9
Ba	10	(1.2)	-18.8	21.2	(22.0)	2.0	42.0
Be	1.0	(0.0)	-2.0	2.0	19.0	16.2	21.9
Cd	1.0	(0.70)	-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
Со	1.0	(1.0)	-1.0	3.0	20.0	17.0	23.0
Cu	2.0	(8.0)	4.0	12.0	(25.0)	21.0	29.0
Fe	200	[100000]			[100000]		
Pb	1.0	(4.0)	2.0	6.0	25.0	21.3	28.8
Mg	500	[100000]			[100000]		
Mn	1.0	(7.0)	5.0	9.0	27.0	23.0	31.1
Мо		[2000]			[2000]		
Ni	1.0	(6.0)	4.0	8.0	24.0	20.4	27.6
Р		[100000]			[100000]		
K	500	[100000]			[100000]		
Se	5.0	(0.30)	-9.7	10.0	(19.0)	9.0	29.0
Ag	1.0	(0.0)	-2.0	2.0	18.0	15.3	20.7
Na	500	[100000]			[100000]		
S		[100000]			[100000]		
TI	1.0	(0.0)	-2.0	2.0	21.0	17.9	24.2
Ti		[2000]			[2000]		
V	5.0	(0.50)	-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.

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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

	1. Lead(II) nitrate (Pb)	Compound
[1] Spectrum No.1	IN029 PBD122018A1	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 (%)
To a line	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
	intrvns-rat 93 mg/kg 3128	tached pg.) LD50
	3128	NIST

3	9. O III	m/z->	1.006	m/z-> 2.0E6	5.0E6	1.0E7
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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):

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-	W	40,02	41	<0.2	Se	40.02	Ţ	40,02	3	∆ 0.02	Ε	40.02	H	△ 0.02	پل ا	20.02	2	20.02	2 2
<0.02	W	0.02	占	40.2	Se	<0.02	P	<0.02	Z	<0.02	E	40.02	Нf	<0.02	Dy	40.02	-	8	

Physical Characterization:

(T)= Target analyte

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

Son I Mills

Certified by:

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

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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):

	17	20,02	Ξ	70.02	12	20.02	200	707	-	20.0%	740	-	2	4000		200		-	ŀ
_	1	3	j	3	7	3	?	٥	7	3	5	7	¥	<u>\$</u>	An	4000	2	40.172	<u></u>
_	Zn	40.02	S'n	40.02	S	<0.02	Sm	<0.02	≯	<0.02	Mo	40.02	2	40.02	Ç	40.02	S	40.02	<u> </u>
_	~	<0.02	Tm	40.02	ň	0.02	2	40,02	סי	<u> </u>	Ж	6 0.2	7	40.02	Ç	40.02	, Ç	<u> </u>	Ве
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_	<	40.02	ㅂ	40.02	æ	40.02	R	<0.02	ဝွ	40,01	Mg	40.02	5	40.02	臣	40.02	, E	8 2	5
_	u	<0.02	F	40.02	ī.	40.02	Re	<0.02	\$	40.02	Ę	40.02	픙	40.02	E	6 2	, Ç	A).(52	. S
-	W	40,02	41	<0.2	Se	40.02	Ţ	40,02	3	∆ 0.02	Ε	40.02	H	△ 0.02	پل ا	20.02	2	20.02	2 2
<0.02	W	0.02	占	40.2	Se	<0.02	P	<0.02	Z	<0.02	E	40.02	Нf	<0.02	Dy	40.02	-	8	

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(T)= Target analyte

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

M4371

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

Suitable for Mercury Determination (hydroxylammonium chloride)

Rec - 06.07.12





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 SO ₄)	<= 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

Jamie Ethier
Vice President Global Quality



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.		
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 <
                                                               0.000201
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   Au <
          0.003631 M Gd <
                            0.000201 M Ni <
                                              0.000402 M
                                                        Sn <
                                                               0.001007
M
   B <
          0.001208 M
                    Ge <
                            0.000201 M Os <
                                              0.000605 M
                                                        Sr <
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M Ba <
          0.000201 M Hf <
                            0.000201 O P <
                                              0.032370 M
                                                        Ta <
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  Be <
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                    Hq <
                                              0.000201 M Tb <
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M Bi <
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                    Ho <
                            0.000201 M Pd <
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  Ca
          0.000007 M In <
                            0.000201 M Pr <
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  Cd <
          0.000201 M Ir
                            0.000201 M
                                      Pt <
                                              0.000402 M Ti <
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                                              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 <
                            0.000201 M
                                      Re <
                                              0.000201 M Tm <
                                                               0.000201
  Cr <
0
          0.003021 O Li <
                            0.000107 M
                                      Rh <
                                              0.000201 M U <
                                                               0.008058
M
  Cs <
          0.001208 M Lu <
                            0.000201 M Ru <
                                              0.000201 M V <
                                                               0.000201
M
  Cu <
          0.000402 O
                    Mg
                            0.000001 O
                                      S <
                                             0.053950 M W <
                                                               0.000604
M Dy <
          0.000201 M Mn <
                            0.000604 M Sb <
                                             0.001208 M Y <
                                                               0.000201
M Er <
          0.000201 M Mo
                           0.000009 M Sc <
                                             0.000201 M Yb <
                                                               0.000201
```

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Volume shown below was diluted to (mL): NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: Part **BTU9** 1000 58024 060523 Ambient (20 °C) 060526 Chromium (Cr) Lot 2000.02 Dilution 0.058 5E-05 Initial Flask Uncertainty Balance Uncertainty Uncertainty 21110221 Nominal Lot # 2.0% Nitric Acid Solvent: (III) Initial 40.0 Nitric Acid Final Formulated By: Reviewed By: Uncertainty Expanded Lavense (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Lawrence Barry **SDS Information** 060523 060523

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

ori-rat 3250 mg/kg 3112a

Compound

Number

Number

Factor

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/mL)

CAS#

OSHA PEL (TWA)

LD50

TSIN SRM

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

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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		
	Zr	Zn	~	뀱	۷	Ϥ	W	可能を発展		
	<0.02	< 0.02	<0.02	<0.02	40.02	40.02	<0.02	SALES OF SALES		

(I)= larget analyte

Physical Characterization:

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

Certified by:

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

M5697 B: 10/27/23

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

CERTIFIED WEIGHT REPORT:	וה						Lot #	Solvent:						
- P	Part Number: Lot Number: Description:		58029 102523 Copper (Cu)	5			24002546	Nitric Acid						
							2.0%	40.0	Nitric Acid	Formulated By:	ÿ:	Benson Chan	102523	ដ
Exp	Expiration Date:		102526	Š				(mL)			7	0		
Recommended Storage: Nominal Concentration (µg/mL):	Recommended Storage: Concentration (µg/mL):		Ambient (20 °C) 1000	Ċ						W	N	Pento	1	
NIST T	NIST Test Number:		витв		5E-05	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	102523	យ
Volume sh	Volume shown below was diluted to (mL):	s dilute	d to (mL):	2000.02	0.058	Flask Uncertainty	*							l
		Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	(Solvent Safety Info. On Attached pg.)	In Attached pg.)	NIST
Compound		Number	Number	Factor	Vol. (mL)		Conc. (µg/mL)	Canc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	V) LD50	SRM
1. Copper(II) nitrate trihydrate (Cu)		58129	100223	0.1000	200.0	0.084	1000	10000.1	1000.0	io io	10031-43-3	1 mg/m3	orl-rat 794 mg/kg	
1.0E6	[1] Spectrum No.1	Z Z		9.422 9.	ec]:58()29.D# [C	33.422 sec]:58029.D# [Count] [Linear]	near]	ordenia.					
5.OE5									na dhinh dha fa indhuga la nghuga ghipa an ghuga ghipa an ghuga ghipa an ghuga ghipa an ghuga ghipa an an an a					
m/z-> 5.0E7	10		N.	<u>ය</u> 0	32 12	6	50	60	70		80	90	100	
2.5E7														
m/z->	1		120	130	0	140	150	160	170		180	190	N 0 0	
2.067														
1.067														
m/z->	210		220	230		240	250	260						

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

		_	_			_		D = 127	-
	Ľ	<u>в</u>	Ве	Ва	As	Sb	Δ		
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	2	, ზ	υ	င္ပ	ပ္ပ	δ	8	1 14	
	-	<0.02	40.02	<0.02	<0.02	40.2	<0.02		
	Au	Š.	Ç	වූ	宦	덕	Ŋ		
	<0.02	40,02	<0.02	<0.02	<0.02	40.02	40.02		
	3	F	팖	=	Ы	Но	Ħ		
	40.02	40.02	40.2	△0.02	<0.02	<0.02	40.02	I ace M	Trace M
	Nd	Мо	Hg	M	Mgg	Lu	<u>E</u>	Grais	10+010
(T) = Target analyte	A0,02	<0.02	40.2	40.02	10.05	40.02	40.02	AGLILICA	Vorifica
et anal	×	7	ק	Ъ	တ္တ	3	Z		
vie	<0.2	40.02	40.02	40.02	40.02	<0.02	<0.02	by icr-iv	202
	Sc	Sm	Ru	Rb	Rh	Re	Pr	C	
	A0.02	<0.02	<0.02	40.02	40.02	40.02	40.02	g/1111L)	
	Ta	Ø	Sr	Z	Ag	S:	Š		
	40,02	<0.02	40.02	40.2	40.02	40.02	40.2		
	77	Sn	F	Ħ	::	Te	급		
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	<0.02	∆ 0,02	∆ 0.02	40.02	∆ 0.02	∆ 0.02	40.02		

1.1

Physical Characterization:

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

Certifled by:

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

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

ırt # 58029

2 of 2



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

CERTIFIED WEIGHT REPORT:

02/09/24 Lot #

24002546

Nitric Acid Solvent:

Part Number: Lot Number: Description: 57004 102523

Beryllium (Be)

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

Expiration Date:

102526

BTU₉

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

Nominal

(IE) 40.0

2.0%

Nitric Acid

Benson Chan

102523

Formulated By:

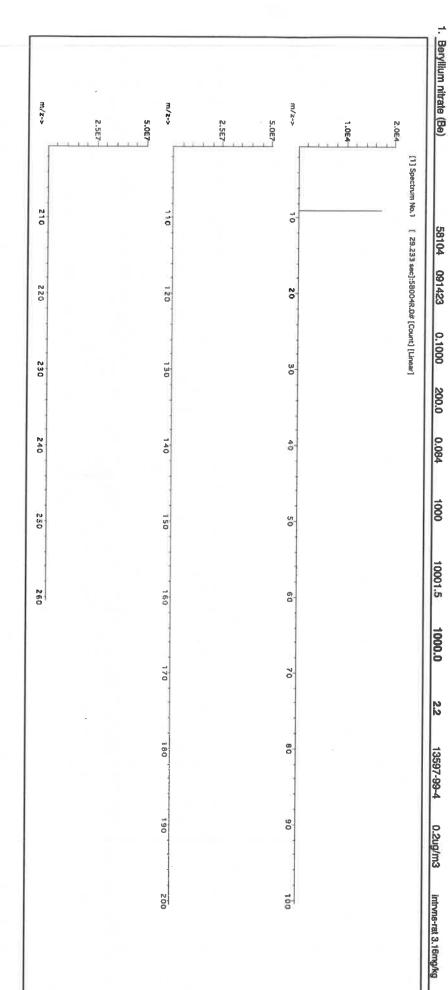
Pedro L. Rentas

102523

Reviewed By:

Pipette (mL) Conc. (µg/mL) 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

₹







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800-368-1131



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

40.02 Cd 40.02 Dy 40.02 Cg 40.02 Br 40.02 Cg 40.02 Br 40.02 Cg 40.02 Gd T Cr 40.02 Gd 40.02 Co 40.02 Gg
40.02 Cd 40.02 40.02 Cc 40.02 40.02 Cc 40.02 7 Cr 40.02 40.02 Cc 40.02 40.02 Cc 40.02 40.02 Cc 40.02 40.02 Cc 40.02
40.02 Cd 40.02 40.02 Cc 40.02 40.02 Cc 40.02 7 Cr 40.02 40.02 Cc 40.02 40.02 Cc 40.02 40.02 Cc 40.02 40.02 Cc 40.02
40.02 40.02 40.02 40.02 40.02 40.02
a B B B B S B

(T) = Target analyte

Physical Characterization:

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

Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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

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

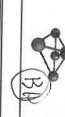
Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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 WEIGHT REPORT:

Part Number:

57050 071123 Tin (Sn) 202109 Salvents: 21110221 Lot # 1224 Nitric Acid

22D0562008

Hydrochloric acid

3 6% 10.0 30.0 Hydrochloric acid Nitric Acid Formulated By:

Benson Chan

071123

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 071126

Recommended Storage:

Expiration Date:

Description: Lot Number:

Reviewed By: Pedro L. Rentas

Weight shown below was diluted to (mL): **NIST Test Number: BTU9** 499.93 0.058 Flask Uncertainty 5E-05 Balance Uncertainty 071123

1. Ammonium hexafluorostannate(IV) (Sn) [1] Spectrum No.1 IN010 SND042023A1 RM# Number ρţ Conc. (µg/mL) Nominal 1000 (%) Uncertainty Assay
Purity (%) (%) 0.10 44.2 1.13107 Weight (g) Target 1.13286 Weight (g) Conc. (ug/ml.) Actual 1001.6 Actual +/- (µg/mL) Uncertainty Expanded 2.0 CAS# SDS Information
(Solvent Safety Info. On Attached pg.)
LD50 7 mg/m3 ₹ 3161a SRM

m/z-> ---x/m --Z/111 2.5E4 5.0E4 1.0ES 2.0E6 2.5E5 S.OEG 210 110 0 120 220 N [15.034 sec]:58150.D# [Count] [Linear] 230 130 8 240 140 40 250 150 Ö 160 260 60 170 70 180 80 190 90 200 100

1 of 2

Part # 57050

Lot # 071123



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

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	4002 4002 4002 4002	
	* > > \$ × 2 ×	
	600 600 600 600 600	

(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.

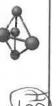
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CERTIFIED WEIGHT REPORT:						Fot#	Solvent:						
Part Number:		57027				24002546	Nitric Acid			2			
Lot Number: Description:		091923 Cobalt (Co)	ī						C fam) may	D.		
1						2.0%	40.0	Nitric Acid	Formulated By:	Lawr	Lawrence Barry	091923	
Expiration Date:		091926					(Jw.)		1	\	0		
Recommended Storage:		Ambient (20 °C)	်						N.	X			
Nominal Concentration (ug/ml.):		1000							Leens	1	4		
NIST Test Number:		eUTB		5E-05	Balance Uncertainty	\$			Reviewed By:	Pedn	Pedro L. Rentas	091923	
Volume shown below was diluted to (mL):	r was dilute	d to (mL):	2000.02	0.058	0.058 Flask Uncertainty								
									Expanded	S	SDS Information		
	Part	ĕ	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solvent Sal	(Solvent Safety Info. On Attached pg.)	hed pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Vol. (ml.) Pipette (ml.) Conc. (µg/ml.)	nc. (ug/mL)	Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL)	Conc. (µg/ml.)		CAS# OSHA	OSHA PEL (TWA)	LDSO	SRM

[1] Speatrum No.1									Sulfill too willing	0110
	[34.243 8ec	34.243 sec]:58027.D# [Count] [Linear]	[Count] [Lit	Lagr						
5.0 Е5				70						
m/z-> 10 20		. 4	9	<u>.</u>	20	80	0		00	
5.0E7										
TVZ-> 110 120	130	140	150	100	170	180		0	500	
5.0E7										

1 of 2

260

280

240

230

220

010

W/z->

Printed: 2/8/2024, 5:01:14 PM

Certified Reference Material CRM





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

							Trace M	etals	Verifical	tion	by ICP-M	4S (F	g/mL)						
1							STREET, STREET	No section lives	ALL DESCRIPTION OF THE PERSON	10.000	Market Mark	MINNSH.	Sanday Marine	NAME OF TAXABLE PARTY.	Service of the last	SECOND SECOND		No.	A STATE OF STREET
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ౙ	40.02	రే	40 7	占	<0.02	H9	<0.02	.3	₹005	Ź	₹0.02	2	<0.02	Š	40.02	T _e	40.05	5	40.02
As	40.2	ප	40.02	呂	40.02	ų	<0.02	Mg	10.05	ඊ	₹0.02	됩	<0.02	Ag	40.02	F	<0.02	>	₩ 40.02
쯃	40.02	చ	40.02	3	4002	ㅂ	<0.02	Ma	<0.02	콘	₹000	2	40.02	N _a	40.2	Ę	20:0>	g,	Ø.02
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遥	40 .02	රි	۳	Ğ,	4002	ដ	<0.02	Mo	40.02	Æ	20'0 >	S	<0.02	S	40.02	Sn	40.02	Zn	Ø.02
æ	<0.02	ට්	<0.02	Αn	<0.02	윤	Z0.0>	P	<0.02	м	40.2	S	₩	Fee Fee	40,02	Ħ	Ø.02	Z	Ø.02

(T)= Target analyte

Physical Characterization:

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



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Lot # 091923

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02/00/24 Certified Reference Material CRM

W 580



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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
						3
N 0		110		ō		[] Speatrum No.1
						Z 0.1
000		200		N.		ő
230		130		30		[34.433 sec]:57033.D# [Count] [Linear]
		The state of the s		er gere		90]:570
N 40		140		ò)33.D#
N 0		-d-1		50		[Count]
Ö		Ö		0		Lines
N O		160		0		5
		170		70		
		180		80		
		0				
		190		90		
		A1	-			
		NOO		100		

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

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= Target	M P P B S K N	를 이	
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R	4444 444 444 444 444 444 444 444 444 4	g/mL)	
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	Z Z Y Z < C &		
	40.02 40.02 40.02 40.02 40.02		

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 Nominal 0.058 Flask Uncertainty Purity Uncertainty Assay Target

40.0 Nitric Acid

22%

Formulated By:

Reviewed By: into Pedro L. Rentas

Lawrence Barry

041723

041723

NIST SRM

Expanded SDS Information

Conc. (µg/mL) 10000 99,999 3 Purity (%) 0.10 27.5 E 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

1. Ammonium dihydrogen phosphate (P)

IN008 PV082019A1

RM#

Compound

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

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	Ta	Ø	ų	Z,	. ≱	S:	જ			
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	TI	Sn	Tm	∄	Ħ	Te	ď			
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	Zr	Zn	Υ.	\$	<	Ϥ	W			
	<0.02	6002	A).02	∆.02	\$0.0 2	A0.02	40.02	TO THE REAL PROPERTY.		

(I)= larget analyte

Physical Characterization:

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

Certified by:

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Part # 57115

2 of 2

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Certified Reference Material CRM

199124

M5817

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

www.absolutestandards.com CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 57116 071123

Solvent:

071123

ASTM Type 1 Water

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:

BIO9

Weight shown below was diluted to (mL): Ĕ 1999.48 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Actual Actual Reviewed By: Expanded

Ammonium sulfate (S) IN117 SLBR7225V RM# Number Conc. (µg/mL) 10000 99.9 3 Purity (%) 0.10 24.3 8 82.4675 Weight (g) Weight (g) Conc. (µg/mL) 82,4682 10000.1 20.0 7783-20-2 Z orl-rat 4250mg/kg 3181

[1] Spectrum No.1

SDS Information

Pedro L. Rentas

071123

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

Part # 57116

1 of 2

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

	B Be Bs Sb Al	
	40.02 40.02 40.02 40.02	
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	5242455	
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	3524585	_
	40,02 40,02 40,02 40,02 40,02	
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(T)= Tarnet analyte	40.02 40.02 40.02 40.02 40.02 40.02	
hanaka	K R P R S Ni	
Ď	by ICP	
	×	
	(µg/mL)	
	Na Si	I
	40.2 40.02 40.02 40.02 40.02 7	
	To T	
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	7 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
	40.00 40.00 40.00 40.00 40.00	

Physical Characterization:

(1)= larger analyte

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

Certified by:

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

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



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->		į,	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):	Expiration Date: Recommended Storage:		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)	76007	060624 Selenium (Se)	57034	
Ŋ			<u></u>		ω	3.702	0.1000	Factor	Dilution	2000.07			<u>ර</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	10002.5	Conc. (µg/mL	Initial				(mL)	40.0	Na Contraction	Solvent:	
0							1000.0	Conc. (µg/mL) Conc. (µg/mL)	Final					Nitric Acid			(1)
			170		70		2.2	.) +/- (µg/mL)	Uncertainty	Expanded	Reviewed By:	100	N	Formulated By:			10
			180		80		7782-49-2	C	(So		y:	100	11	By:			
			190		90		2 0.2 mg/m3	OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)	SDS Information	Pedro L. Rentas	achie		Benson Chan	M		
			200		100			NA)). On Atta	rmation	ntas	,		בֿן			
			-		J		orl-rat 6700 mg/kg	LDS0	ched pg.)		060624			060624			
							3149	SRM	NIST		4			4		_	



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

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

							Trace M	etals	Verifica	tion	by ICP-M	irl) SI	₃/mL)						
A	40,02	Cd	40.02	DΨ	A0.02	H	40.02	E.	40.02	Z.	40.02	Pr	A0.02	Se	T	₽	40.02	W	A).02
Sb	40.02	ධු	<0.2	떀	<0.02	Ж	<0.02	Ę	<0.02	₽	<0.02	Re	<0.02	Si	<0.02	Te	40.02	U	<0.02
As	<0.2	င္ပ	<0.02	핃	<0.02	H H	<0.02	Mg	<0.01	၀ွ	<0.02	Rh	40.02	Ag	<0.02	∄	40.02	۷	<0.02
Ва	<0.02	S	<0.02	2	<0.02	Ir	<0.02	Mn	<0.02	R	40.02	Rb.	40.02	Na	40.2	Ħ	40.02	4	<0.02
Ве	40.01	Ω	<0.02	Ga	<0.02	Fe	40.2	Нg	4 02	P	<0.02	Ru	40.02	Sr	<0.02	Tm	<0.02	¥	<0.02
В:	40.02	င္ပ	<0.02	ଦ୍ଧ	40.02	Ľ	<0.02	Mo	<0.02	7	<0.02	Sm	40.02	S	<0.02	Sn	40.02	Zn	<0.02
В	<0.02	δ	<0.02	Au	<0.02	Рь	<0.02	M	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	Ħ	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

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

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

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

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

2 of 2

Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



ACCREDITATION / REGISTRATION

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

PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

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

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

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

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

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

Assay Information:

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

The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance $\frac{1}{1000}$

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

XCRANGAM = (x_a) (ucher a) X = x_a mass of Assay Method A with x_a = x_a the standard uncertainty of

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

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

4.0 TRACEABILITY TO NIST

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

4.2 Balance Calibration

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

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

CRM/RMs are tested for trace metallic impurities by Axial ICP-DES and ICP-MS. The result from the most sensitive method for each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of ore each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of the property of the property

e2 M 078220.0 > gN O 882000.0 > u3 M 8g < 0.000536 M Eu <

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

Page 2 of 4

INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

> uA M 882000.0

> 9A M 886 0.000.0

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

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

> iN O 882000.0 > aO M 841200.0

> dN O 322500.0 > N M 862000.0

M - Checked by ICP-MS

Mn < Mg < Li <

> 0H

> 6H

ΉŁ

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

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

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

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

> 6T M 882000.0 > AT M 882000.0

sT M 034450.0 > dT M E70100.0

s 852000.0 M 882000.0

O.000269 O

O.043560 O

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

> II

JS

674000.0 228610.0

892000.0 892000.0

0.000268

699630.0

0.001341

892000.0

0.010560

960000'0

960000.0

73260.0 > nZ O 402100.0 038540.0 > nZ O 267400.0

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

7.7 Storage and Handling Recommendations

oM M 882000.0

0.000268 M K 0.000268 M K 0.000268 M K

0.000872 O Fe > 0.008586 M Ga <

O 892000.0

O S37000.0 M 882000.0

M 882000.0

M 603100.0

M 885800.0

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

INTENDED USE

W Et < O Cn <

O B <

IA O

4.1 Thermometer Calibration

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

Page 3 of 4

- Chemical Testing - Accredited / AZLA Certificate Number 863.01

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

- QSR Certificate Number QSR-1034

1.01 ISO 9001 Qualify Management System Registration

MOITATY STANDARD DOCUMENTATION 0.01

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

This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. The Columbiant of the contract of the Columbiant of the Colu

HOMOGENEITY

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

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

Ollinger		C INTOTINATION (ICP_OEC n.	Idoseomeni	
ss radial/axial view):	are given	Estimation (ICP-OES D.L.s	Technique/Line	
Interferences (Underline 11)	Order	idq 41	ICP-MS 48 amu	
Interferences (underlined indicates severe) 32S16O, 32S14N,	A/N	add		
14N160180,				
14N17N2, 36Ar12C,				
48Ca, [96X=2				
7-V001 (no a				
(where X = Zr, Mo, Ru)]		10000 () 1900 ()	ICP-OES 323.452 nm	
Ce, Ar, Ni		Jm/gu Se000.0 \ +200.0	ICP-0ES 334.941 nm	
		m/pu 820000.0 \ 8500.0	ICP-OES 336.121 nm	
ла, Та, Сг, U М М9 Ω-	1 1		F Note: This standar	ŀ
W, Mo, Co		In/gy 4500000 \ cocos-	nous prepries sur secon	٠

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

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

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

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

HNO3 / LDPE container. 1-10.000 ppm sincle element solutions as the Ti(F)8-2 chemically stable for year media. Unstable at ppm levels with metals that would pull F-away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming the hydrafed oxide in all dilute adds except HF. Chemical Compatibility - Soluble in concentrated HCI, HF, H3PO4 H2SO4 and HNO3. Avoid neutral to basic Atomic Weight, Valence; Coordination Number; Chemical Form in Solution - 47.87 +4 6 Ti(F)6-2

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

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

Twitte sociate in the secied 101 beg, trainspleaded for the orderiver in the shalfy concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss. - While stored in the sealed TCT bag, transpiration of this CRWRM is negligible. After opening the sealed TCT bag, transpiration in a negligible in the capture managed in the capture

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

Page 4 of 4

Chairman / Senior Technical Director

- Sealed TCT Bag Open Date:

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

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

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

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

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

Thomas Kozikowski Manager, Quality Control Certificate Approved By:

thibils Validity

- June 17, 2027 11.2 Lot Expiration Date

June 17, 2022 11.1 Certification Issue Date

Paul Gaines Certifying Officer:

0.Sr

0.11

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

Certified Reference Material CRM

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com			×	18 EZ X	ertified R	eference l	Certified Reference Material CRM	2	72/		ANA AR- https:	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	credited Number ards.com
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number: Lot Number:		57092 060724				24002546	Nitric Acid		2	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1 parte		020
Description:		Uranium (U)	q						* APV	3			
						2.0%	40.0	Nitric Acid	Formulated By:		Giovanni Esposito	060724	
Expiration Date:		060727					(mf.)		7		2		
Recommended Storage:		Ambient (20 °C)	်							1	V		
Nominal Concentration (µg/mL):		1000							Jan	to the	Code		
NIST Test Number:		6UTB		5E-05 Balance	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	060724	
Volume shown below was diluted to (mL):	was dilute	d to (mL):	2000.07	0.100	0.100 Flask Uncertainty			-					<u> </u>
									Expanded		SDS Information	ion	
	Part	Lot	Dilution	Initial	Initial Uncertainty	Nominal	Initial	Final	Uncertainty	(Solvent	(Solvent Safety Info. On Attached pg.)	Attached pg.)	TSIN
Compound	Number	Number	Factor	Vol. (mL)	Vol. (mL) Pipette (mL) Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL) Conc. (µg/mL)	Conc. (µg/mL)	+/- (ug/mL)	CAS#	OSHA PEL (TWA)	DSO.	SRM
1. Uranyl nitrate hexahydrate (U)	58192	58192 041524	0.1000		200.0	1000	10001	1000.0	c	4000004	200		
				1	5000	200	2.10001	NOON!	217	13020-83-7	U.US ING/IIIS	on-rat 1040 mg/kg	3164

1.0E6	2 ************************************			3		•				
5.0E5										
m/z-> 5.0E4	10	O	O _E	6	Og	O O	0,	08	OG	100
2.5E4										
m/z->	0	1 NO	130	64.0	160	160	170	180	190	000
5.0E5				***************************************						
m/a->	OF	8	230	240	250	260				

Lot # 060724





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

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

							Trace M	etals	Verificat	tion	by ICP-M	VIS CE	(lm/p/							
	AUGUSTALISMO	September 1	Treatment and the last	MARKET LIES	MINISTER STATES		STATE OF STREET	And Personal Property lies	THE REAL PROPERTY.				5			ı				-
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ŝ	<0.02	చ	<0.5	ri.	8	2	5		000	. 5	900	-	70'05	2	7'0>	97	40.02	*	40.02	-
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ĉ	707	3	2000	로 -	Ø.02	<u> </u>	40.02	M	10.05	ő	40.02	R	2000	Αo	29	F	5	>	4	_
Ba	<0.02	ඊ	<0.02	ሪ	<0.02	브	<0.02	M	<0.05	ď	2	á	2	<u>.</u> و	7000	= 6	20:02	>	20:05 40:05	_
æ	<0.01	ඊ	<0.02	පී	<0.02	Ę,	<0.2	Η̈́	200		200	2 4	70.05	2 5	7.00	= ,	40.02 1	£	40.02	_
ä	<0.02	රි	<0.02	පී	<0.02		<0.02	Š	200	٥ .	20:05	ا ا	20:05	j (<0.02	<u> </u>	<0.02	> -	Ø.02	-
æ	<0.05	õ	<0.02	A	8	á	500	2	20:00	, A	20:05	H C	70.05	0	<0.02	Z.	40.02	<u>"Z</u>	40.02	_
					2010		70.00	זאו	20:02	4	7.0>	2	40.02		2002	F	5	7.	200	_

(T) = Target analyte

Physical Characterization:

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





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

All standard containers are meticulously cleaned prior to use.

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

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

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

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

Printed: 6/7/2024, 3:58:45 PM

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 (NO₃)	≤ 0.2 ppm	< 0.1 ppm
Phosphate (PO4)	≤ 0.5 ppm	< 0.1 ppm
Trace Impurities – Aluminum (Al)	≤ 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
Ве	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Bi	ICP Assay	3106	180815
Ce	ICP Assay	3110	160830
Ce	EDTA	928	928
Ce	Calculated		See Sec. 4.2
Co	ICP Assay	3113	190630
Co	EDTA	928	928
Co	Calculated		See Sec. 4.2
In	ICP Assay	3124a	110516
In	EDTA	928	928
In	Calculated		See Sec. 4.2
Li	ICP Assay	3129a	100714
Lí	Calculated		See Sec. 4.2
Li	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Ni	Calculated		See Sec. 4.2
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Pb	Calculated		See Sec. 4.2
U	ICP Assay	traceable to 3164	R2-U689597
U	Calculated		See Sec. 4.2

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

Characterization of CRM/RM by Two or More Methods

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

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) = $U_{CRM/RM} = k (u^2_{chars} + u^2_{bb} + u^2_{its} + u^2_{ts})^{\frac{1}{2}}$

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



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

ACCREDITATION / REGISTRATION 1.0

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CHEM-CLP-4

Lot Number:

V2-MEB746172

Matrix:

3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s):

1 000 µg/mL ea:

Boron,

Molybdenum,

Silicon,

Tin,

Titanium

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

ANALYTE Boron, B

CERTIFIED VALUE

ANALYTE Molybdenum, Mo **CERTIFIED VALUE**

1 000 ± 5 µg/mL

Silicon, Si

1 000 ± 5 µg/mL 1 000 ± 7 µg/mL

Tin. Sn

1 000 ± 5 µg/ml.

Titanium, Ti

1 000 ± 6 μg/mL

Density:

1.032 g/mL (measured at 20 ± 4 °C)

Assav Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

utts = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

Characterization of CRM/RM by One Method

is used is the mean of individual results:

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

Certified Value, X_{CRM/RM}, where one method of characterization

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 12, 2024

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

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

Paul R Sains

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Joseph Burns Custom VS Manager

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

9 R19/30

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

m/2>	5.0m/	m/z->>	5.0E7	m/z-*-	G. O. M. G.	*. O M O	1. Zirconyl chloride octahydrate (Zr)	Compound		Velime	Recommended Storage: Nominal Concentration (μg/mL):	D.		CERTIFIED WEIGHT REPORT:
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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).

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] 88
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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

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

Г							Trace Me	etals	Verifica	tion	by ICP-	SM	(µg/mL)						
A	40.02	2	40.02	Dγ	40.02	H	<0.02	<u>E</u>	<0.02	Z	<0.02	꾸	<0.02	Se	40.2	<u>4</u>	<0.02	*	<0.02
dS	<0.02	ರಿ	<0.2	뎍	<0.02	Н	<0.02	Ę	40.02	ş	<0.02	Re	<0.02	ž.	40.02	Te	<0.02	c	<0.02
As	40.2	င္ပ	40.02	띹	<0.02	In	<0.02	Mg	40.01	0°	<0.02	쫑	<0.02	A	8,02	1	<0.02	<	40.02
Ba	40.02	ς,	<0.02	ନୁ	40.02	F	40.02	Mn	H	Pd	<0.02	&	40.02	Z	40,2	1	<0.02	충	< 0.02
Ве	40.01	ប៉	40.02	ଦ୍ମ	40.02	7,	40.2	Hg	<0.2	Þ	<0.02	Ru	40.02	Sr	0.02	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	60.02
B	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	×	40.2	S	<0.02	Ta	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	M	Fe	<	0.027000	M	Nb	<	0.001300	s	Si	<		0	Zr	<	0.001900
М	As	<	0.001900	М	Ga	<	0.001300	M	Nd	<	0.000310	М	Sm	<	0.000310				
М	Au	<	0.000910	М	Gd	<	0.000310	M	Ni	<	0.005500	М	Sn		0.000096				
M	В		0.016180	M	Ge	<	0.001900	M	Os	<	0.000610	0	Sr		0.000092				
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	М	Pd	<	0.000610	M	Te	<	0.000910				
0	Ca		0.011557	M	ln	<	0.000310	M	Pr	<	0.000310	M	Th	<	0.001900				
M	Cd	<	0.000310	M	lr	<	0.000310	M	Pt	<	0.000310	М	Ti		0.001078				
M	Ce	<	0.000610	0	K		0.000577	M	Rb	<	0.009100	М	TI	<	0.000310				
M	Co	<	0.001600	M	La	<	0.000310	M	Re	<	0.000310	М	Tm	<	0.000310				
М	Cr	<	0.010000	0	Li	<	0.000460	М	Rh	<	0.000310	М	U	<	0.000310				
М	Cs	<	0.000310	M	Lu	<	0.000310	M	Ru	<	0.000310	0	V	<	0.001300				
М	Cu	<	0.002500	0	Mg		0.001348	0	S	<	0.570000	М	W	<	0.001900				
М	Dу	<	0.000310	М	Mn	<	0.002500	M	Sb	<	0.000310	M	Υ	<	0.000310				
M	Er	<	0.000310	M	Мо	<	0.000310	0	Sc	<	0.000590	M	Yb	<	0.000310				

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

6.0 **INTENDED USE**

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

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

- 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:

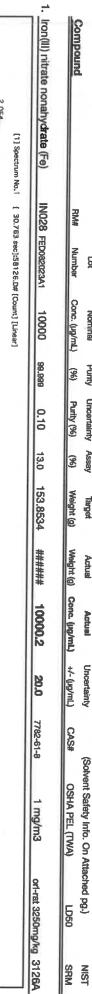
Paul Gaines Chairman / Senior Technical Director

Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Lot#

Nominal Concentration (µg/mL): Recommended Storage: Weight shown below was diluted to (mL): NIST Test Number: **Expiration Date:** Part Number: Description: Lot Number: 58126 011025 Iron (Fe) **8TB** 10000 011028 Ambient (20 °C) 2000.07 R->1/18/25 M6140 0.100 Flask Uncertainty 5E-05 Balance Uncertainty Solvent: 22% 24012496 40.0 Nitric Acid Nitric Acid Reviewed By: Formulated By: Expanded Pedro L. Rentas Benson Chan SDS Information 011025 011025



Q

Nominal

Purity

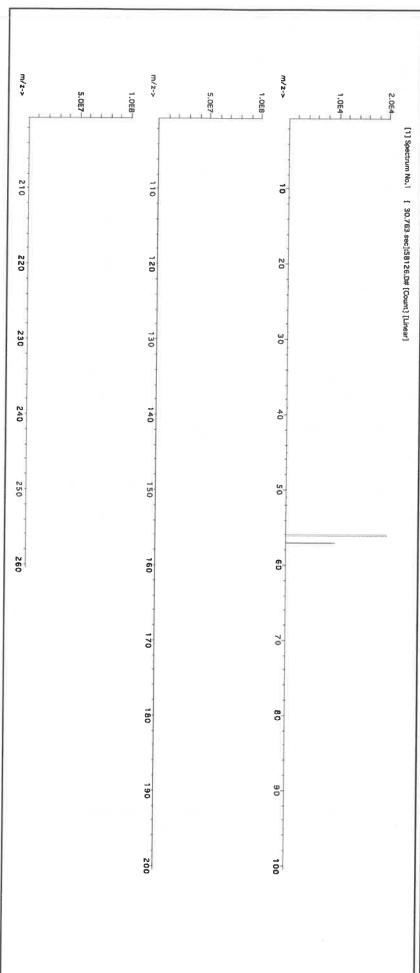
Uncertainty

Target

Actual

Actual

Uncertainty



Certified Reference Material CRM



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

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

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_	a (000		3	7	3	Z.	3	κ.	3	S	A) 02	<u></u>	A 0.02	1	8000	Zr	40.02

(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).

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: 1. Potassium nitrate (K) Compound Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: IN034 KD062022A1 BTU9 57119 103024 Potassium (K) M6141 10000 103027 Ambient (20 °C) Number 5 Conc. (µg/mL) 4000.1 10000 716142 Nominal R->1/13/25 0.15 Flask Uncertainty 99.999 5E-05 Balance Uncertainty Purity 8 Uncertainty Purity (%) 0.10 Solvent: 24002546 Assay 37.7 E 2% Weight (g) 106.1040 Target 80.0 Lot # Nitric Acid Nitric Acid ###### Weight (g) Conc. (µg/mL) Actual 10001.1 Actual Reviewed By: Formulated By: +/- (µg/mL) Uncertainty Expanded 20,0 Tieranie. 7757-79-1 CAS# (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Giovanni Esposito からからかん OSHA PEL (TWA) **SDS Information** 5 mg/m3 orl-rat 3750 mg/kg 3141a LD50 103024 103024 SRM NIST

m/z->	Ø000	m/z->	1.0E5	m/z->	1.0E6	2.0E6
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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):

	Ш	В	ᄪ	В	As	S	>	I		1
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	Ta	S	Sr	Na.	Ag	Si	Se	i		ı
	<0.02	40.02	<0.02	40.2	<0.02	A0.02	<0.2	- L		
	Ti	Sn	Tm	H	1	Te	Тb			I
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	<0.02	∆0,02	<0.02	<0.02	<0.02	40.02	<0.02			

(i) = larget analyte

Physical Characterization:

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

Certified by:

- * 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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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.

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1 of 2

www.absolutestandards.com



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

ĺ	B	<u>B</u>	Be	Ba	As	Sb	≥	9		
	<0.02	<0.02	10.0>	<0.02	40.2	<0.02	<0.02			
İ	5	င္ပ	Ω	C,	දි	C C	S			
	<0.02	<0.02	<0.02	<0.02	<0.02	40.2	<0.02			
ı	Au	ဂ္ဂ	ନ୍ଥ	<u>ਨ</u>	Eu	E)	Дy			
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	Pb	L	Fe	F	In	Но	Hf			
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	×	7	Þ	Pd	0°	ğ	Z.		tion	
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	Sc	Sm	Ru	Rb	Rh	Re	Pr		ES (II	
	<0.02	<0.02	<0.02	<0.02	<0.02	40.02	<0.02		g/mL)	
	Ta	S	Sr	Z	Ag	S:	%			
	<0.02	<0.02	△0.02	Т	<0.02	<0.02	40.2			
	11	Sn	Tm	Ħ	1	Te	41	i		
	<0.02	△0.02	<0.02	<0.02	40.02	<0.02	<0.02			
	Zr	Zn	۲	\$	<	C	W			
	40.02	40.02	<0.02	<0.02	<0.02	<0.02	<0.02	IIIO SCOTI		

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

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

All standard containers are meticulously cleaned prior to use.

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

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

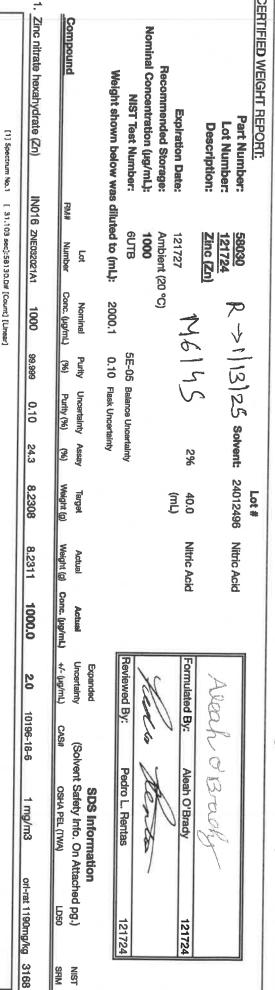
All Standards should be stored with caps tight and under appropriate laboratory conditions.

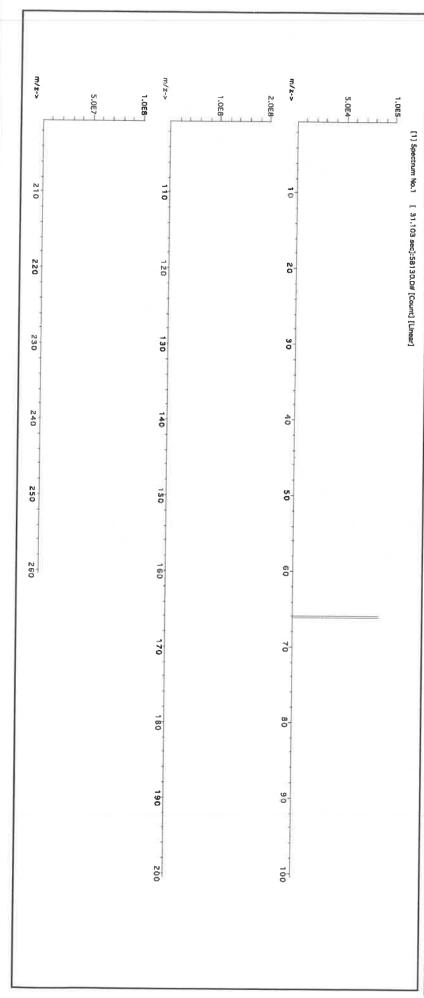
Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58111

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

Www.absolutestandards.com CERTIFIED WEIGHT REPORT:





Part # 58030



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
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					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

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 - 36.0 % ≤ 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
	≤ 50.0 ppb	163.0 ppb
Trace Impurities - Chromium (Cr)	≤ 1.0 ppb	0.7 ppb
Trace Impurities - Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities - Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Frace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Frace Impurities – Gold (Au)	≤ 4.0 ppb	0.6 ppb
Heavy Metals (as Pb) Trace Impurities – Iron (Fe)	≤ 100 ppb	< 50 ppb
	≤ 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
Frace 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 (±) = $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, X_{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	M	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	М	ΤI	<	0.000480			
М	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	М	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;

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 11.0

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

Mayyand Kha Paul R. Laine **Custom Processing Supervisor**

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Lot # 032123

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



Certified Reference Material CRM

R -> 6/12/24

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

m/z->	1.OE6-	₽.OE6 ,	m/z-y	1000-	2000	m/z->	2.0E5 1.0E5	1. Ammonium molybdate (Mo)	Compound	Volume shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Expiration Date:		Lot Number: Description:	CERTIFIED WEIGHT REPORT:
210			110			10	[1] Spectrum No.1	58142	Part Number)w was dilut	ber:	nL):	ate:		on:	
220			120			20		112322	Lot Number	ed to (mL):	6UTB	1000	032126 Ambient (20 °C)		032123 Molybdenum (Mo)	67042
Ŋ			4			ω.	8.594	0.1000	Dilution Factor	3000.41		Š	<u>o</u>		ım (Mo)	
230			130			30	sec]:570	300.0	Initial Vol. (mL)	0.058						
240			140			40	8.594 sec]:57042.D# [Count] [Linear]	0.084	Uncertainty Nominal Pipette (mL) Conc. (µg/mL)	Flask Uncertainty	Balance Uncertainty					
250			150			50	Count] [t	1000	Nominal Conc. (µg/mL)	×	inty			0.5%	MKBC859/V	Lot #
260			1.00			60	_inear]	10001.4	Initial Conc. (µg/mL)				(mL)	15.0	Ammonium nyaroxide	
			170			70		1000.0	Final Conc. (µg/mL)					Ammonium hydroxide	OXIGE	
			0				ı	2.1	Uncertainty +/- (µg/mL)	Expanded	Reviewed By:	N)	Formulated By:	1	
			200			80		13106-76-8	CAS		³y:	de		By:	Geron	
			190			90		-8 5 mg(Mo)/m3	(Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) . LD50	SDS Information	Pedro L. Rentas	Rento	N	Lawrence Barry		
			000			100	×	orl-rat 333 mg/kg	n Attached pg.)) LD50	ation	00	,			I	
								g/kg 3134	NIST		032123			032123		



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

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

- 1			_			_	_		_
	В	Bi	Ве	Ва	As	SЪ	Αl		
	<0.02	<0.02	<0.01	<0.02	<0.2	<0.02	<0.02		
	δ	S	ζ	ಜ	೮	Ca	Œ		
	<0.02	<0.02	<0.02	<0.02	<0.02	40.2	<0.02		
	Au	ල	G	&	딸	Ę	Dy		
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
	Рb	La	Æ	F	Ħ	Но	Ħf		
	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02		Trace M
	Z.	Mo	Hg	¥	Mg	Ľ	Ľ		letals
T (T)	<0.02	H	40.2	<0.02	<0.01	<0.02	<0.02		Verifica
(T)- Target analyte	~	77	P	묜	ဝွ	₹	Z.	Ì	tion
nakata	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		by ICP-N
	Sc	Sm	2	공	靐	Re	Pr		IS (u
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		g/mL)
	Ta	S	Sr	N _a	Ag	S:	Se		
	<0.02	40.02	<0.02	<0.2	<0.02	<0.02	<0.2		
	11	Sn	Tm	₽	Ħ	Te	ъ		
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
	Zr	Zn	Y	47	<	U	W		
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		

(I)= larget analyte

Physical Characterization:

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

Certified by:

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

 * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in
- the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

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

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

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





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

Assay (HNOs) Appearance Appearance Appearance Passes Test Passes Test Passes Test Color (APHA) Residue after Ignition Chloride (Cl) Phosphate (POa) Sulfate (SOa) Sulfate (SOa) Sulfate (SOa) Arsenic and Antimony (as As) Arsenic in and Antimony (as As) Arsenic and Antimony (as As) Arsenic and Antimony (as As) Arsenic and Interest Bairum (Ba) Arace Impurities - Beryllium (Ba) Arace Impurities - Beryllium (Ba) Arace Impurities - Boron (B) Arace Impurities - Cadmium (Cd) Arace Impurities - Cadmium (Cd) Arace Impurities - Calcium (Ca) Arace Impurities - Calcium (Ca) Arace Impurities - Calcium (Ca) Arace Impurities - Color (Co) Arace Impurities - Calcium (Ca) Arace Impurities - Color (Cu) Arace Impurities - Color (Cu) Arace Impurities - Color (Cu) Arace Impurities - Color (Au) Arace Impurities - Color (Au) Arace Impurities - Color (Au) Arace Impurities - Lead (Pb) Arace Impurities - Lithium (Li) Arace Impurities - Manganese (Mn) Arace Impurities - Nickel (Ni) Arace Impurities - Manganese (Mn) Arace Impurities - Nickel (Ni) Arace Impurities - Manganese (Mn) Arace Impurities - Nickel (Ni) Ar	Test	Specification	Result
Appearance Color (APHA) Residue after Ignition Chloride (Cl) Phosphate (POa) Sulfate (SOa) Trace Impurities - Barium (Ba) Trace Impurities - Cobalt (Co) Trace Impurities - Lead (Pb) Trace Impur	Assay (HNO3)		
Second Capera	Appearance		
Residue after Ignition	Color (APHA)		
Chloride (Cf) Phosphate (PO ₄) Sulfate (SO ₄) Sulfate (SO ₄) Trace Impurities – Aluminum (AI) Arsenic and Antimony (as As) Trace Impurities – Beryllium (Ba) Trace Impurities – Beryllium (Be) Trace Impurities – Beryllium (Be) Trace Impurities – Boron (B) Trace Impurities – Cadrium (Cd) Trace Impurities – Cadrium (Cd) Trace Impurities – Cadrium (Ca) Trace Impurities – Cobalt (Co) Trace Impurities – Cobalt (Co) Trace Impurities – Cobalt (Co) Trace Impurities – Copper (Cu) Trace Impurities – Gallium (Ga) Trace Impurities – Gold (Au) Expressible 10.0 ppb Trace Impurities – Gold (Au) Expressible 10.0 ppb Trace Impurities – Colon (Fe) Trace Impurities – Lichium (Li) Trace Impurities – Lichium (Li) Expressible 10.0 ppb Trace Impurities – Manganese (Mn) Expressible 10.0 ppb Trace Impurities – Manganese (Mn) Expressible 10.0 ppb Ex	Residue after Ignition		5
Phosphate (PO ₄) ≤ 0.10 ppm < 0.03 ppm	Chloride (CI)		1 ppm
Sulfate (SO ₄) ≤ 0.2 ppm < 0.2 ppm Trace Impurities - Aluminum (AI) ≤ 40.0 ppb < 1.0 ppb Arsenic and Antimony (as As) ≤ 5.0 ppb < 2.0 ppb Trace Impurities - Barium (Ba) < 10.0 ppb < 1.0 ppb Trace Impurities - Beryllium (Be) < 10.0 ppb < 1.0 ppb Trace Impurities - Bismuth (Bi) < 20.0 ppb < 10.0 ppb Trace Impurities - Boron (B) < 10.0 ppb < 5.0 ppb Trace Impurities - Cadmium (Cd) < 50 ppb < 1 ppb Trace Impurities - Calcium (Ca) < 50.0 ppb < 1.0 ppb Trace Impurities - Chromium (Cr) < 30.0 ppb < 1.0 ppb Trace Impurities - Chromium (Cr) < 30.0 ppb < 1.0 ppb Trace Impurities - Cobalt (Co) < 10.0 ppb < 1.0 ppb Trace Impurities - Copper (Cu) < 10.0 ppb < 1.0 ppb Trace Impurities - Gallium (Ga) < 10.0 ppb < 1.0 ppb Trace Impurities - Gold (Au) < 20 ppb < 10 ppb Trace Impurities - Gold (Au) < 20 ppb < 100 ppb Trace Impurities - Lithium (E) < 10.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) < 10.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) < 10.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) < 10.0 ppb < 1.0 ppb Trace Impurities - Mangaese (Mn) < 10.0 ppb < 1.0 ppb	Phosphate (PO ₄)		< 0.03 ppm
Trace Impurities - Aluminum (AI) ≤ 40.0 ppb < 1.0 ppb	Sulfate (SO ₄)	• •	< 0.03 ppm
Arsenic and Antimony (as As)	Trace Impurities - Aluminum (AI)		
Trace Impurities - Barium (Ba) ≤ 10.0 ppb < 1.0 ppb		• •	• •
Trace Impurities – Beryllium (Be) Trace Impurities – Bismuth (Bi) Trace Impurities – Boron (B) Trace Impurities – Cadmium (Cd) Trace Impurities – Cadmium (Cd) Trace Impurities – Calcium (Ca) Trace Impurities – Chromium (Cr) Trace Impurities – Chromium (Cr) Trace Impurities – Cobalt (Co) Trace Impurities – Cobalt (Co) Trace Impurities – Copper (Cu) Trace Impurities – Copper (Cu) Trace Impurities – Gallium (Ga) Trace Impurities – Gallium (Ga) Trace Impurities – Gold (Au) Trace Impurities – Gold (Au) Express of the series of the			• •
Trace Impurities – Bismuth (Bi)		• •	< 1.0 ppb
Trace Impurities – Boron (B)			< 1.0 ppb
Trace Impurities - Cadmium (Cd) Frace Impurities - Calcium (Ca) Frace Impurities - Chromium (Cr) Frace Impurities - Chromium (Cr) Frace Impurities - Cobalt (Co) Frace Impurities - Copper (Cu) Frace Impurities - Callium (Ga) Frace Impurities - Gallium (Ga) Frace Impurities - Germanium (Ge) Frace Impurities - Gold (Au) Frace Impurities - Gold (Au) Frace Impurities - Fron (Fe) Frace Impurities - Lead (Pb) Frace Impurities - Lithium (Li) Frace Impurities - Magnesium (Mg) Frace Impurities - Manganese (Mn) Frace Impurities - Nickel (Ni)			• •
Trace Impurities – Calcium (Ca)		• •	< 5.0 ppb
Trace Impurities - Chromium (Cr) Trace Impurities - Cobalt (Co) Trace Impurities - Copper (Cu) Trace Impurities - Copper (Cu) Trace Impurities - Gallium (Ga) Trace Impurities - Garmanium (Ge) Trace Impurities - Gold (Au) Heavy Metals (as Pb) Trace Impurities - Iron (Fe) Trace Impurities - Lead (Pb) Trace Impurities - Lead (Pb) Trace Impurities - Lithium (Li) Trace Impurities - Magnesium (Mg) Trace Impurities - Magnesium (Mg) Trace Impurities - Manganese (Mn) Trace Impurities - Magnesium (Mg) Trace Impurities - Manganese (Mn) Trace Impurities - Nickel (Ni)		• ,	< 1 ppb
Trace Impurities – Cobalt (Co)			2.3 ppb
Trace Impurities - Copper (Cu) Trace Impurities - Gallium (Ga) Trace Impurities - Germanium (Ge) Trace Impurities - Gold (Au) Example 10.0 ppb			< 1.0 ppb
Trace Impurities – Gallium (Ga) Trace Impurities – Germanium (Ge) Trace Impurities – Gold (Au) Heavy Metals (as Pb) Trace Impurities – Iron (Fe) Trace Impurities – Lead (Pb) Trace Impurities – Lead (Pb) Trace Impurities – Lithium (Li) Trace Impurities – Magnesium (Mg) Trace Impurities – Magnese (Mn) Trace Impurities – Nickel (Ni)		• •	< 1.0 ppb
Trace Impurities – Germanium (Ge) Trace Impurities – Gold (Au) Heavy Metals (as Pb) Trace Impurities – Iron (Fe) Trace Impurities – Lead (Pb) Trace Impurities – Lead (Pb) Trace Impurities – Lithium (Li) Trace Impurities – Magnesium (Mg) Trace Impurities – Magnesium (Mg) Trace Impurities – Manganese (Mn) Trace Impurities – Nickel (Ni) Trace Impurities – Nickel (Ni)		• • • • • • • • • • • • • • • • • • • •	< 1.0 ppb
Trace Impurities – Gold (Au) 4 20 ppb 5 ppb 6 5 ppb 7 Trace Impurities – Iron (Fe) 6 40.0 ppb 6 20.0 ppb 7 Trace Impurities – Lithium (Li) 6 10.0 ppb 7 Trace Impurities – Magnesium (Mg) 7 Trace Impurities – Manganese (Mn) 7 Trace Impurities – Manganese (Mn) 7 Trace Impurities – Mickel (Ni)	· •		< 1.0 ppb
Heavy Metals (as Pb) Second Policy Second Policy		• • •	< 10 ppb
Trace Impurities – Iron (Fe) \$\leq\$ 40.0 ppb \$\leq\$ 40.0 ppb \$\leq\$ 20.0 ppb \$\leq\$ 20.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 20 ppb \$\leq\$ 20 ppb \$\leq\$ 20 ppb \$\leq\$ 20 ppb \$\leq\$ 21.0 ppb \$\leq\$ 10.0 ppb \$\leq\$ 20 ppb \$\leq\$ 21.0 ppb			< 5 ppb
Trace Impurities – Lead (Pb) ≤ 20.0 ppb ≤ 20.0 ppb < 10.0 ppb < 10.0 ppb < 1.0 ppb		• •	100 ppb
Frace Impurities – Lithium (Li) Frace Impurities – Magnesium (Mg) Frace Impurities – Manganese (Mn) Frace Impurities – Manganese (Mn) Frace Impurities – Nickel (Ni) Frace Impurities – Nickel (Ni)		• •	< 1.0 ppb
Frace Impurities – Magnesium (Mg) Frace Impurities – Manganese (Mn) ≤ 20 ppb ≤ 1.0 ppb < 1 ppb < 1.0 ppb < 1.0 ppb		• •	< 10.0 ppb
Frace Impurities – Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb			< 1.0 ppb
race Impurities – Nickel (Ni)			< 1 ppb
≤ 20.0 ppb < 5.0 ppb		• •	< 1.0 ppb
	THERET (INI)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>





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

Test	Specification	D 1
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	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 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
race Impurities – Zirconium (Zr)		< 1.0 ppb
Particle Count – 0.5 µm and greater	≤ 10.0 ppb	< 1.0 ppb
Particle Count – 1.0 µm and greater	≤ 60 par/mi	10 par/ml
and greater	≤ 10 par/ml	3 par/ml

Nitric Acid 69% **CMOS**





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

Test Specification Result

For Microelectronic Use

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

Jamie Croak Director Quality Operations, Bioscience Production





M-6162

R. Date & 0412712025

Material No.: 9606-03 Batch No.: 24H0162012 Manufactured Date: 2024-06-28

Retest Date: 2029-06-27 Revision No.: 0

Certificate of Analysis

Assay (HNOs) Appearance Passes Test Passes Test Passes Test Color (APHA) Residue after Ignition S 2 ppm Chloride (Cl) Choride (Cl) Choride (SOa) Sulfate (SOa) Sulfate (SOa) Arsenic and Antimony (as As) Trace Impurities - Barlum (Ba) Trace Impurities - Barlum (Ba) Trace Impurities - Barlum (Cd) Trace Impurities - Barlum (Cd) Trace Impurities - Coper (Cu) Trace Impurities - Coper (Cu) Trace Impurities - Coper (Cu) Trace Impurities - Cold (Au) Frace Impurities - Gold (Au) Frace Impurities - Iron (Fe) Trace Impurities - Iron (Fe) Trace Impurities - Lind must (Magnesia (Magnesia (Magnesia)) Frace Impurities - Lead (Pb) Trace Impurities - Lind (Fe) Trace Impurities - Coper (Cu) Trace Impurit	Test	Specification	Result
Appearance Color (APHA)	Assay (HNO3)	69.0 - 70.0 %	69.7 %
Color (APHA) ≤ 10 5 Residue after Ignition ≤ 2 ppm < 1 ppm	Appearance		
Residue after Ignition ≤ 2 ppm < 1 ppm	Color (APHA)	≤ 10	
Chloride (CI) ≤ 0.08 ppm 0.03 ppm Phosphate (PO4) ≤ 0.10 ppm < 0.03 ppm	Residue after Ignition	≤ 2 ppm	
Phosphate (PO₄) ≤ 0.10 ppm < 0.03 ppm	Chloride (CI)	≤ 0.08 ppm	
Sulfate (SO ₄) ≤ 0.2 ppm < 0.2 ppm	Phosphate (PO ₄)	≤ 0.10 ppm	• •
Trace Impurities - Aluminum (Al) ≤ 40.0 ppb < 1.0 ppb	Sulfate (SO ₄)	≤ 0.2 ppm	
Arsenic and Antimony (as As) \$\leq\$ 5.0 ppb	Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	• •
Trace Impurities – Barium (Ba)	Arsenic and Antimony (as As)	≤ 5.0 ppb	
Trace Impurities – Beryllium (Be) Trace Impurities – Bismuth (Bi) Trace Impurities – Boron (B) Trace Impurities – Cadmium (Cd) Trace Impurities – Calcium (Ca) Trace Impurities – Calcium (Ca) Trace Impurities – Chromium (Cr) Trace Impurities – Cobalt (Co) Trace Impurities – Cobalt (Co) Trace Impurities – Copper (Cu) Trace Impurities – Copper (Cu) Trace Impurities – Callium (Ga) Trace Impurities – Gallium (Ga) Trace Impurities – Gallium (Ga) Trace Impurities – Germanium (Ge) Trace Impurities – Gold (Au) Heavy Metals (as Pb) Trace Impurities – Iron (Fe) Trace Impurities – Lead (Pb) Trace Impurities – Lead (Pb) Trace Impurities – Magnesium (Mg) Trace Impurities – Manganese (Mn) Trace Impurities – Mickel (Ni) ■ 200 ppb ■ 21.0 ppb ▼ 10.0 ppb	Trace Impurities - Barium (Ba)	≤ 10.0 ppb	
Trace Impurities – Bismuth (Bi) \$\leq 20.0 ppb	Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	• •
Trace Impurities – Boron (B) ≤ 10.0 ppb 0.1 ppb Trace Impurities – Cadmium (Cd) ≤ 50 ppb < 1 ppb Trace Impurities – Calcium (Ca) ≤ 50.0 ppb 0.3 ppb Trace Impurities – Chromium (Cr) ≤ 30.0 ppb 0.1 ppb Trace Impurities – Cobalt (Co) ≤ 10.0 ppb	Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	• •
Trace Impurities - Cadmium (Cd) ≤ 50 ppb 0.3 ppb Trace Impurities - Calcium (Ca) ≤ 50.0 ppb 0.3 ppb Trace Impurities - Chromium (Cr) ≤ 30.0 ppb 0.1 ppb Trace Impurities - Cobalt (Co) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Copper (Cu) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Gallium (Ga) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Germanium (Ge) ≤ 20 ppb < 1 ppb Trace Impurities - Gold (Au) ≤ 20 ppb < 1 ppb Trace Impurities - Gold (Au) ≤ 20 ppb < 1.0 ppb Trace Impurities - Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities - Lead (Pb) ≤ 20.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb Trace Impurities - Magnesee (Mn) ≤ 10.0 ppb < 1.0 ppb	Trace Impurities - Boron (B)	≤ 10.0 ppb	• •
Trace Impurities - Calcium (Ca) ≤ 50.0 ppb 0.3 ppb Trace Impurities - Chromium (Cr) ≤ 30.0 ppb 0.1 ppb Trace Impurities - Cobalt (Co) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Copper (Cu) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Gallium (Ga) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Germanium (Ge) ≤ 20 ppb < 1 ppb Trace Impurities - Gold (Au) ≤ 20 ppb < 1 ppb Trace Impurities - Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities - Lead (Pb) ≤ 20.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb	Trace Impurities - Cadmium (Cd)	≤ 50 ppb	
Trace Impurities - Chromium (Cr) ≤ 30.0 ppb 0.1 ppb Trace Impurities - Cobalt (Co) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Copper (Cu) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Gallium (Ga) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Germanium (Ge) ≤ 20 ppb < 1 ppb Trace Impurities - Gold (Au) ≤ 20 ppb < 1 ppb Heavy Metals (as Pb) ≤ 100 ppb < 50 ppb Trace Impurities - Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities - Lead (Pb) ≤ 20.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1.0 ppb	Trace Impurities - Calcium (Ca)		• •
Trace Impurities - Cobalt (Co) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Copper (Cu) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Gallium (Ga) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Germanium (Ge) < 20 ppb < 1 ppb Trace Impurities - Gold (Au) ≤ 20 ppb < 1 ppb Heavy Metals (as Pb) ≤ 100 ppb < 50 ppb Trace Impurities - Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities - Lead (Pb) < 20.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities - Magnesee (Mn) ≤ 10.0 ppb < 1.0 ppb	Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	
Trace Impurities - Copper (Cu) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Gallium (Ga) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Germanium (Ge) ≤ 20 ppb < 1 ppb Trace Impurities - Gold (Au) ≤ 20 ppb < 1 ppb Heavy Metals (as Pb) ≤ 100 ppb < 50 ppb Trace Impurities - Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities - Lead (Pb) ≤ 20.0 ppb < 1.0 ppb Trace Impurities - Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities - Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities - Magnesium (Mg) ≤ 10.0 ppb < 1.0 ppb	Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	
Trace Impurities – Gallium (Ga) ≤ 10.0 ppb < 1.0 ppb Trace Impurities – Germanium (Ge) ≤ 20 ppb < 1 ppb Trace Impurities – Gold (Au) ≤ 20 ppb < 1 ppb Heavy Metals (as Pb) ≤ 100 ppb < 50 ppb Trace Impurities – Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities – Lead (Pb) ≤ 20.0 ppb < 1.0 ppb Trace Impurities – Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Manganese (Mn) ≤ 10.0 ppb	Trace Impurities - Copper (Cu)	≤ 10.0 ppb	• •
Trace Impurities – Germanium (Ge) ≤ 20 ppb < 1 ppb Trace Impurities – Gold (Au) ≤ 20 ppb < 1 ppb Heavy Metals (as Pb) ≤ 100 ppb < 50 ppb Trace Impurities – Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities – Lead (Pb) ≤ 20.0 ppb < 1.0 ppb Trace Impurities – Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb	Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	
Trace Impurities - Gold (Au) ≤ 20 ppb < 1 ppb	Trace Impurities - Germanium (Ge)	≤ 20 ppb	
Heavy Metals (as Pb) ≤ 100 ppb < 50 ppb Trace Impurities – Iron (Fe) ≤ 40.0 ppb < 1.0 ppb Trace Impurities – Lead (Pb) ≤ 20.0 ppb < 1.0 ppb Trace Impurities – Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb	Trace Impurities - Gold (Au)	≤ 20 ppb	• •
Trace Impurities – Iron (Fe) ≤ 40.0 ppb < 1.0 ppb	Heavy Metals (as Pb)	≤ 100 ppb	
Trace Impurities – Lead (Pb) ≤ 20.0 ppb < 1.0 ppb	Trace Impurities - Iron (Fe)	≤ 40.0 ppb	
Trace Impurities – Lithium (Li) ≤ 10.0 ppb < 1.0 ppb Trace Impurities – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb	Trace Impurities - Lead (Pb)	≤ 20.0 ppb	• • • • • • • • • • • • • • • • • • • •
Trace Impurities – Magnesium (Mg) ≤ 20 ppb < 1 ppb Trace Impurities – Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb Trace Impurities – Mickel (Ni)	Trace Impurities - Lithium (Li)	≤ 10.0 ppb	. ,
Trace Impurities - Manganese (Mn) ≤ 10.0 ppb < 1.0 ppb	Trace Impurities – Magnesium (Mg)	≤ 20 ppb	• •
Trace Impurities Mickel (Ni)	Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	
	Trace Impurities – Nickel (Ni)	≤ 20.0 ppb	< 1.0 ppb

>>> Continued on page 2 >>>





Material No.: 9606-03 Batch No.: 24H0162012

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities - Potassium (K)	≤ 50 ppb	< i ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	1 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	≤ 150.0 ppb	< 1.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Thallium (TI)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Tin (Sn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count – 0.5 µm and greater	≤ 60 par/ml	13 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	5 par/ml

Nitric Acid 69% **CMOS**





Material No.: 9606-03 Batch No.: 24H0162012

Test Specification Result

For Microelectronic 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:
 QCP-CICV-1

 Lot Number:
 V2-MEB744107

 Matrix:
 7% (v/v) HNO3

Value / Analyte(s): 2 500 μg/mL ea:

Calcium, Potassium,
Magnesium, Sodium,

1 000 µg/mL ea:

Aluminum, Barium,

500 μg/mL ea:

Iron,

250 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese,

125 μg/mL ea:

Silver, Copper,

100 μg/mL ea: Chromium, 25 μg/mL ea: Beryllium

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Aluminum, Al	CERTIFIED VALUE 1 000 ± 4 µg/mL	ANALYTE Barium, Ba	CERTIFIED VALUE 1 000 ± 6 μg/mL
Beryllium, Be	24.98 ± 0.12 μg/mL	Calcium, Ca	2 500 ± 8 μg/mL
Chromium, Cr	99.9 ± 0.6 μg/mL	Cobalt, Co	250.2 ± 1.2 μg/mL
Copper, Cu	125.0 ± 0.5 μg/mL	Iron, Fe	500.0 ± 2.2 μg/mL
Magnesium, Mg	2 500 ± 11 μg/mL	Manganese, Mn	249.9 ± 1.1 μg/mL
Nickel, Ni	250.0 ± 1.2 μg/mL	Potassium, K	2 500 ± 11 μg/mL
Silver, Ag	125.0 ± 0.6 μg/mL	Sodium, Na	2 500 ± 11 μg/mL
Vanadium, V	250.0 ± 1.1 μg/mL	Zinc, Zn	249.9 ± 1.1 μg/mL

Density: 1.081 g/mL (measured at 20 \pm 4 °C)

Assay Information:

133	ay iiiioiiiiatioii.			
	ANALYTE	METHOD	NIST SRM#	SRM LOT#
	Ag	ICP Assay	3151	160729
	Ag	Volhard	999c	999c
	Al	ICP Assay	3101a	140903
	Al	EDTA	928	928
	Ва	ICP Assay	3104a	140909
	Ва	Gravimetric		See Sec. 4.2
	Be	ICP Assay	3105a	090514
	Be	Calculated		See Sec. 4.2
	Ca	ICP Assay	3109a	130213
	Ca	EDTA	928	928
	Co	ICP Assay	3113	190630
	Co	EDTA	928	928
	Cr	ICP Assay	3112a	170630
	Cu	ICP Assay	3114	120618
	Cu	EDTA	928	928
	Fe	ICP Assay	3126a	140812
	Fe	EDTA	928	928
	K	ICP Assay	3141a	140813
	K	Gravimetric		See Sec. 4.2
	Mg	ICP Assay	3131a	140110
	Mg	EDTA	928	928
	Mn	ICP Assay	3132	050429
	Mn	EDTA	928	928
	Na	ICP Assay	3152a	200413
	Na	Gravimetric		See Sec. 4.2
	Ni	ICP Assay	3136	120619
	Ni	EDTA	928	928
	V	ICP Assay	3165	160906
	V	EDTA	928	928
	Zn	ICP Assay	3168a	120629
	Zn	EDTA	928	928

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

 $egin{align*} \mathbf{u_{bb}} = \mathbf{bottle} \ \mathbf{to} \ \mathbf{bottle} \ \mathbf{homogeneity} \ \mathbf{standard} \ \mathbf{uncertainty} \ \mathbf{u_{lts}} = \mathbf{long} \ \mathbf{term} \ \mathbf{stability} \ \mathbf{standard} \ \mathbf{uncertainty} \ (\mathbf{storage}) \ \end{aligned}$

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

u_{char a} = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u_{char a} = the errors from characterization

 $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{lts}}$ = 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)

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

Note: This solution contains Silver (Ag), please refer to our Sample Preparation Guide for more information (https://www.inorganicventures.com/sample-preparation-guide/samples-containing-silver)

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 22, 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

- May 22, 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:	

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

Justin Dirico Stock Processing Supervisor

Juster Dilies Juster Wall Parel R. Laines

Certificate Approved By:

Jodie Wall Stock VSM Coordinator

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

⁻ 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.



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: QCP-CICV-2 Lot Number: U2-MEB733713

Matrix: 3% (w/v) Tartaric acid

1% (v/v) HNO3

Value / Analyte(s): 500 µg/mL ea:

Antimony

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE

Antimony, Sb 500.0 \pm 2.8 μ g/mL

Density: 1.017 g/mL (measured at 20 \pm 4 °C)

Assay Information:

 ANALYTE
 METHOD
 NIST SRM#
 SRM LOT#

 Sb
 ICP Assay
 3102a
 140911

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

Characterization of CRM/RM by Two or More Methods

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

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

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

 \mathbf{w}_i = the weighting factors for each method calculated using the inverse square of

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

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

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

 $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{lts}}$ = 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

u_{char a} = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

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

 $egin{align*} \mathbf{u_{bb}} &= \mathrm{bottle} \ \mathrm{to} \ \mathrm{bottle} \ \mathrm{homogeneity} \ \mathrm{standard} \ \mathrm{uncertainty} \ \mathbf{u_{lts}} &= \mathrm{long} \ \mathrm{term} \ \mathrm{stability} \ \mathrm{standard} \ \mathrm{uncertainty} \ (\mathrm{storage}) \ \end{aligned}$

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)

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 01, 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 01, 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:	
· Scalcu I C I Dau Obell Dale.	

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

20178Ci.



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: QCP-CICV-3

Lot Number: V2-MEB749572

Matrix: 7% (v/v) HNO3

Value / Analyte(s):

500 μg/mL ea:

Arsenic, Lead, Selenium, Thallium,

250 μg/mL ea: Cadmium

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Arsenic, As 500.0 \pm 3.1 μ g/mL Cadmium, Cd 250.1 \pm 1.1 μ g/mL Lead, Pb 500.0 \pm 2.3 μ g/mL Selenium, Se 500.0 \pm 3.2 μ g/mL

Thallium, TI 500.0 \pm 3.0 μ g/mL

Density: 1.040 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

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

k = coverage factor = 2

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

 $egin{align*} \mathbf{u_{bb}} = \mathbf{bottle} \ \mathbf{to} \ \mathbf{bottle} \ \mathbf{homogeneity} \ \mathbf{standard} \ \mathbf{uncertainty} \ \mathbf{u_{lts}} = \mathbf{long} \ \mathbf{term} \ \mathbf{stability} \ \mathbf{standard} \ \mathbf{uncertainty} \ (\mathbf{storage}) \ \end{aligned}$

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:

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

Xa = mean of Assay Method A with

 $\mathbf{u}_{\mathbf{char}\ \mathbf{a}}$ = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u_{char a} = the errors from characterization

 $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{lts}}$ = 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

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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

January 02, 2025

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

11.2 Lot Expiration Date

- January 02, 2030
- 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:	
Ocalca IOI	Day Open Date.	

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

Justin Dirico Stock Processing Supervisor

Juster Dilies Juster Wall Parel R. Laines

Certificate Approved By:

Jodie Wall Stock VSM Coordinator

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

⁻ 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.

Lot # 011525

R->2115124

Certified Reference Material CRM

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

CRM

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

CERTIFIED WEIGHT REPORT: 1. Magnesium nitrate hexahydrate (Mg) IN030 мgp05202341 Nominal Concentration (µg/mL): W/Z-> m/z-> m/z-> Recommended Storage: Weight shown below was diluted to (mL): 2.0€4 1.0E4 5.0E5 1.0E6 1000 2000 NIST Test Number: Expiration Date: Part Number: Description: Lot Number: [1] Spectrum No.1 210 110 10 RM# **BTU9** 58112 011525 10000 Ambient (20 °C) 011528 Magnesium (Mg) Number 120 ᅙ 220 20 [19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.07 10000 Nominal M 6171 130 230 30 0.100 Flask Uncertainty 99.999 Purity 5E-05 Balance Uncertainty 8 Uncertainty Assay Purity (%) 240 0.10 140 40 Solvent: 8.51 8 2% 250 24012496 150 234.9183 Weight (g) 50 Target Lot # (<u>m</u>L 40.0 234.9195 Nitric Acid Weight (g) Conc. (µg/mL) Nitric Acid Actual 260 160 60 10000.1 Actual 170 ò Reviewed By: Formulated By: +/- (µg/mL) Uncertainty Expanded 20.0 180 80 13446-18-9 CAS# (Solvent Safety Info. On Attached pg.)
S# OSHA PEL (TWA) LD50 Pedro L. Rentas Benson Chan 190 **SDS Information** ¥ 200 100 orl-rat 5440 mg/kg 3131a 011525 011525 SRM NIST



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

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

	Al Sb Ba Be Bi
	<0.02 <0.02 <0.02 <0.02 <0.01 <0.01 <0.02
	58585
	40.02 40.02 40.02 40.02 40.02 40.02
	Dy Er Gd Ga
	40.00 40.00 40.00 40.00 40.00 40.00
	Hf Ho In He La Pb
	4000 4000 4000 4000 4000 4000 4000 400
	etals Li Li Mg Mg Mo Nd
(T) = Target analyte	Verific:
get anal	Ation Ni Nb Os Pd Pt K
yte	\$\frac{\phi}{\phi}\$ CP-\$ \$\frac{\phi}{\phi}\$ 2
	Rh Rh Sm Sc
	9/mL) -0.02 -0.02 -0.02 -0.02 -0.02 -0.02
	Se Se Na Si S
	40.2 40.02 40.02 40.02 40.02 40.02
	Th Th Sn
	4000
	Z;

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).



R > 1/25/25 M 6/72. 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:

Single Analyte Custom Grade Solution

Catalog Number:

CGNA₁₀

Lot Number:

V2-NA740547

Matrix:

2% (v/v) HNO3

Value / Analyte(s):

10 000 μg/mL ea:

Sodium

Starting Material:

Sodium Carbonate

Starting Material Lot#:

2453 and 2606

Starting Material Purity:

99.9976%

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Value:

 $10018 \pm 30 \, \mu g/mL$

Density:

1.033 g/mL (measured at 20 \pm 4 °C)

Assay Information:

Assay Method #1

10026 ± 18 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2

9986 ± 66 µg/mL

ICP Assay NIST SRM 3152a Lot Number: 200413

Assay Method #3

10002 ± 31 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{\text{CRM/RM}}$, 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_i = the weighting factors for each method calculated using the inverse square of the variance:

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

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

k = coverage factor = 2

 $u_{cher} = [\Sigma((w_i)^2 (v_{cher})^2)]^{1/2}$ where u_{cher} 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_m = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (1) = U_{CRM/RM} = k (u²char a + u²bb + u²its + u²ts)^{1/2}

k = coverage factor = 2

uchar a = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uta = 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 $0.3 \ \mu m$.

M	Ag	<	0.000860	М	Eu	<	0.000860	s	Na	<		0	Se	<	0.034000	0	Zn		0.000387
0	Al		0.003121	0	Fe		0.001622	М	Nb	<	0.000860	0	Si		0.044943	М	Zr	<	0.001800
M	As	<	0.001800	M	Ga	<	0.000860	M	Nd	<	0.000860	M	Sm	<	0.000860				
M	Au	<	0.005700	М	Gd	<	0.000860	0	Ni	<	0.000980	М	Sn	<	0.000860				
0	В	<	0.025000	М	Ge	<	0.003500	M	Os	<	0.029000	М	Sr		0.000436				
M	Ba		0.004494	M	Hf	<	0.000860	0	Р		0.005742	M	Ta	<	0.000086				
0	Be	<	0.000160	М	Hg	<	0.002900	M	Pb	<	0.002600	M	Tb	<	0.000860				
M	Bi	<	0.000860	М	Но	<	0.000860	М	Pd	<	0.004300	M	Te	<	0.004300				
0	Ca		0.112358	М	ln	<	0.000860	М	Pr	<	0.000860	M	Th	<	0.003500				
0	Cd	<	0.000730	М	lr	<	0.000940	M	Pt	<	0.000860	0	Ti		0.000399				
M	Ce	<	0.000860	0	K		0.349560	M	Rb		0.000436	M	TI	<	0.000860				
M	Co	<	0.000860	М	La	<	0.000860	M	Re	<	0.000860	M	Tm	<	0.000860				
0	Cr	<	0.002000	0	Li		0.000224	M	Rh	<	0.000860	M	U	<	0.000860				
M	Cs		0.000287	М	Lu	<	0.000860	M	Ru	<	0.000940	0	V	<	0.001500				
0	Cu	<	0.004100	М	Mg		0.097377	0	S		0.018726	M	W	<	0.007700				
M	Dy	<	0.000860	M	Mn	<	0.007700	М	Sb	<	0.000860	M	Υ	<	0.000860				
M	Er	<	0.000860	0	Мо	<	0.002800	0	Sc	<	0.000610	M	Yb	<	0.000860				

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° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.lnorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.99 +1 (6) Na+(aq) largely ionic in nature

Chemical Compatibility -Soluble in HCl, HNO3, H2SO4 and HF aqueous matrices. Stable with all metals and inorganic anions.

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

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

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 23 amu	310 ppt	n/a	46Ti+2, 46Ca+2
ICP-OES 330.237 nm	2.0 / 0.09 μg/mL	1	Pd, Zn
ICP-OES 588.995 nm	0.03 / 0.006 μg/mL	1	2nd order radiation from R.E.s on some optical designs
ICP-OES 589.595 nm	0.07 / 0.00009 μg/mL	1	2nd order radiation from R.E.s on some optical designs

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;

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 23, 2024

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

11.2 Lot Expiration Date

- February 23, 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:	
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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 Prepared By:

Uyen Truong Custom Processing Supervisor Mayyand Ma Paul R. Laine

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

R>1/27/28

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

1.0 ACCREDITATION / REGISTRATION

M6175

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



2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

6020CAL-1

Lot Number:

V2-MEB742014

Matrix:

5% (v/v) HNO3

tr. HF

Value / Analyte(s):

20 µg/mL ea:

Silver,
Arsenic,
Beryllium,
Cadmium,
Chromium,
Iron,
Magnesium,
Sodium,
Lead,
Selenium,

Vanadium,

Aluminum, Barium, Calcium, Cobalt,

Copper, Potassium, Manganese, Nickel,

Antimony, Thallium, Zinc

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Aluminum, Al	CERTIFIED VALUE 20.02 ± 0.08 µg/mL	ANALYTE Antimony, Sb	CERTIFIED VALUE 20.03 ± 0.11 µg/mL
Arsenic, As	20.03 ± 0.16 μg/mL	Barlum, Ba	20.02 ± 0.11 µg/mL
Berylilum, Be	20.02 ± 0.15 μg/mL	Cadmium, Cd	20.02 ± 0.11 μg/mL
Calcium, Ca	20.03 ± 0.09 μg/mL	Chromium, Cr	20.03 ± 0.13 μg/mL
Cobalt, Co	20.03 ± 0.12 μg/mL	Copper, Cu	20.03 ± 0.10 μg/mL
Iron, Fe	20.04 ± 0.09 μg/mL	Lead, Pb	20.03 ± 0.11 μg/mL
Magnesium, Mg	20.03 ± 0.10 μg/mL	Manganese, Mn	20.03 ± 0.11 μg/mL
Nickel, NI	20.03 ± 0.11 μg/mL	Potassium, K	20.03 ± 0.10 μg/mL
Selenium, Se	20.03 ± 0.13 μg/mL	Silver, Ag	20.03 ± 0.09 μg/mL
Sodium, Na	20.03 ± 0.10 μg/mL	Thailium, Ti	20.03 ± 0.10 μg/mL
Vanadium, V	20.03 ± 0.11 µg/mL	Zinc, Zn	20.03 ± 0.11 μg/mL

Assay Information:

ssay Information:			
ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
As	Calculated		See Sec. 4.2
Ва	ICP Assay	3104a	140909
Ва	Gravimetric		See Sec. 4.2
Ве	ICP Assay	3105a	090514
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
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
К	ICP Assay	3141a	140813
К	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Sb	ICP Assay	3102a	140911
Se	ICP Assay	3149	100901
Ti	ICP Assay	3158	151215
V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRM/RM}, where two or more methods of characterization are 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

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

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

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

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

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

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)

INTENDED USE 6.0

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- 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.

Note: This solution contains Silver (Ag), please refer to our Sample Preparation Guide for more information (https://www.inorganicventures.com/sample-preparation-guide/samples-containing-silver)

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 11, 2024

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

11.2 Lot Expiration Date

- March 11, 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	n 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 Mayyand Man
Paul R. Laine

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certified Reference Material CRM

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

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							2.0	Expanded Uncertainty +/- (µg/mL)	The state of the s	Reviewed By:	N	Formulated By:	
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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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A P	<0.2	<0.02	<0.02	△0.02	40.02	40.02	<0.02	by ICP-	
	Sc	Sm	Ru	Rb	Rh	Re	Pr	MS (
	<0.02	40.02	<0.02	△0.02	40.02	<0.02	<0.02	ug/mL)	
	Ta	S	Sr	Z	Age	S	Se		
	<0.02	<0.02	3	812	△0.02	<0.02	<0.2		
	=	Sn	ij	Ħ	ゴ	Te	7		
	<0.02	\$0.02	<0.02	<0.02	<0.02	40.02	40.02		
	Zr	Zn	~	\$	<	q	W		
	40.02	40,02	40.02	40.02	A0.02	40,02	40.02		

(I) = larger analyte

Physical Characterization:

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

Certifled by:

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

* 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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	.1 .0 .0	N O O	~~×	O . O . M	m/≥->	O.O.M.4	1.0E5	1. Lead(II) nitrate (Pb)	Compound	NIST Test Number: Weight shown below wa	Recommended Storage: Nominal Concentration (µg/mL):		Part Number: Lot Number: Description:
			110 120		0 0		[1] Spectrum No.1	IN029 PBD122016A1	Lot RM# Number	NIST Test Number: 6UTB Weight shown below was diluted to (mL):			
0 0 0			190		©		14.144 seo]:58082.D# [Count] [Linear]	1000 99.999	Nominai Purity U	2000.07	0°C)	70	57082 S\6\7\5 solve
			140 150		40 80		92.D# [Count] [0.10 62.5 3.20015	Uncertainty Assay Target Purity (%) (%) Weight (g)	5E-05 Balance Uncertainty 0.10 Flesk Uncertainty	(m)	%	Solvent: 24014457
) 9-			160		8		Linearj	3.20067	Actual Weight (g)		Đ	.0 Nitric Acid	4457 Nitric Acid
			170		70			1000.2 2.0 1	Actual Uncertainty Conc. (µg/mL) +/- (µg/mL)	Reviewed By:	M	Formulated By:	gr.
			180 190		90			10099-74-8 0.05 mg/m3	(Solvent Safety Info. On Attached pg.) CAS# OSHA PEL (TWA) LE	Ped	Ch Rend	By: Giovanni Esposito	iovannie Especi
			200		100			3 intrvns-rat 83 mg/kg 3128	rmation On Attached pg.) NIST NA) LD50 SRM	031525	89	sito 031525	B

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

								yte	et analyte	(T) = Target									
40.02	Zr	40,02	Ħ	<0.02	Ta	<0.02	Sc	<0.2	*	<0.02	Z		8	<0.02	Au	<0.02	රී	<0.02	œ
40.02	Zn	<0,02	Sn	<0.02	S	<0.02	Sm	<0.02	72	△0.02	Mo	<0.02	5	40.02	ဂ္ဂ	<0.02	င္ပ	<0.02	B
40.02	~	40.02	Tm	\$0.02	Ş	<0.02	Ru	<0.02	Þ	40.2	T	40.2	귾	<0.02	G _R	40.02	Ω	<0.01	Ве
<0.02	4	40.02	Ħ	40.2	Z	<0.02	Rb	<0.02	Ьď	<0.02	M	<0.02	Ir	△0.02	ନୁ	40.02	ర్ల	60.02	Ва
<0.02	<	<0.02	Η	<0.02	æ.	<0.02	Rh	40.02	õ	<0.01	Mg	<0.02	5	<0.02	핃	<0.02	ဂ္ဂ	40.2	As
40,02	C	<0.02	å	<0.02	Si	<0.02	Re	<0.02	R	<0.02	ξ	<0.02	Ho	<0,02	띡	0.2	Ω	<0.02	Зb
<0.02	¥	<0.02	41	<0.2	Sc	<0.02	ħ	<0.02	Z	<0.02	Ξ	<0.02	Ж	<0.02	Dy	<0.02	Ω	<0.02	Α
									I		1								
						ug/mL)	VS (by ICP-I	tion	Verifica	etals	Trace Me							
																	I		Ì

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 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.
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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:



Page 1 of 2



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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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



	Table 1.				NCE CHECK S WITH ICSB-08		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]		in the second
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
Ва	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]		
Cl		[1000000]			[1000000]		
Cr	2.0	(21.0)	17.0	25.0	40.0	34.0	46.0
Со	1.0	(1.0)	-1.0	3.0	20.0	17.0	23.0
Cu	2.0	(8.0)	4.0	12.0	(25.0)	21.0	29.0
Fe	200	[100000]			[100000]		
Pb	1.0	(4.0)	2.0	6.0	25.0	21.3	28.8
Mg	500	[100000]	•		[100000]		
Mn	1.0	(7.0)	5.0	9.0	27.0	23.0	31.1
Мо		[2000]			[2000]		
Ni	1.0	(6.0)	4.0	8.0	24.0	20.4	27.6
Р		[100000]			[100000]		
K	500	[100000]			[100000]		
Se	5.0	(0.3)	-9.7	10.3	(19.0)	9.0	29.0
Ag	1.0	(0)	-2.0	2.0	18.0	15.3	20.7
Na	500	[100000]			[100000]		
S		[100000]			[100000]		
TI	1.0	(0)	-2.0	2.0	21.0	17.9	24.2
Ti		[2000]			[2000]		
V	5.0	(0.5)	-9.5	10.5	(19.0)	9.0	29.0
Zn	5.0	(11.0)	1.0	21.0	(29.0)	19.0	39.0

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

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

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M6027

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R1.8/5/24

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Expiration Date: Part Number: Lot Number: Description: 062027 57028 062024 Nickel (Ni) 1000 Ambient (20 °C) 24002546 2.0% Lot # Nitric Acid Solvent: 40.0 Nitric Acid Formulated By: Benson Chan

	Nickel(II) nitrate hexahydrate (Ni)	Compound	
	58128	Number	Part
	062023	Number	Lot
	0.1000	Factor	Dilution
	200.0	Vol. (mL)	Initial
	0.084	Pipette (mL)	Uncertainty
	1000	Conc. (µg/mL)	Nominal
	10000.4	Conc. (µg/mL)	Initial
	1000.0	Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL)	Final
	2.2	+/- (µg/mL)	Uncertainty
	13478-00-7		(Solve
Ш	1000.0 2.2 13478-00-7 1 mg/m3	CAS# OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)
	orl-rat 1620 mg/kg 3136	LD50	(ttached pg.)
	3136	SRM	TSIN

Volume shown below was diluted to (mL):

2000.07

0.100

Flask Uncertainty

5E-05 Balance Uncertainty

Reviewed By:

Pedro L. Rentas

062024

062024

Expanded

SDS Information

NIST Test Number:

BTUB

~-z/m	5.0E6	m/z->-	2500	m/z->	1.0E5	2.005
						3
N O		0		1		[1] Spectrum No.1
						3 Z 0
N N		200		N		pad pad
						9.136
230		30		30		9.135 sec]:58028.D# [Count] [Linear]
N		: 				58028
240		6		4		.b# [0
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		80		80		
				<i>(</i> 0 :		
		190		90		
		200		100		
		ŏ		ŏ		

Part # 57028



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

	6	<u> </u>	Be	Ба	As	8	2			
	70.02	A).02	A0.01	40.02	40.2	△ 0.02	40.02	Action Services (ATES)		
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	All	. පී	වූ	£	딸	덕	Дy			
	40.02	∆ 0,02	40.02	40.02	40.02	40.02	40.02			
	3	<u> </u>	क्र	F	Б	Ж	Hf			
	40.02	0.02	<u> 0</u> 2	♦0.02	40.02	40.02	<0.02		Trace M	
	Z	Мо	Hg	Mn	Mg	Ę	Ľ		etals	
3=	40.02	40.02	40.2	∆0.02	10.0	0.02	40.02		Verifica	
	5	7	~	Pd	õ	R	Z		tion	
Target analyte	⊕ 2	40.02	40,02	0.02	40.02	40,02	н		by ICP-N	
	જ	Sm	20	Rb	Rh	Re	꾸	DESCRIPTION OF THE PERSON OF T	S (h	
	40.02	₫002	40.02	40.02	40.02	40.02	<0.02		I/mL)	
	Ta	S	Ş	Na	Ag	83	Se			
	<0.02	40,02	40,02	402	40.02	40.02	40.2			
	=	Sn	Ħ	Ħ	∄	Te	4T			
	40.02	40.02	40.02	∆ 0,02	40.02	40.02	<0.02			
	27	Zn	×	¥	۷	a a	₩			
	40.02	∆ 0.02	A).02	40.02	<u>A</u>	∆ 0.02	∆ 0.02			

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

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Certified Reference Material CRM

M6030



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

Solvent: 24002546

Nitric Acid

Ambient (20 °C) Silver (Ag) 122826 2% <u>E</u> 80.0 Nitric Acid

Formulated By:

Benson Chan

122823

122823

Recommended Storage:

Expiration Date:

Lot Number:

Description:

Nominal Concentration (µg/mL): NIST Test Number: Weight shown below was diluted to (mL): 1000 **6UTB** 헏 4000.30 Nominal 0.058 Flask Uncertainty Purity Uncertainty Assay 5E-05 Balance Uncertainty Target Actual Actual Uncertainty Reviewed By: Expanded (Solvent Safety Info. On Attached pg.) Pedro L. Rentas SDS Information

1. Silver nitrate (Ag) Compound IN035 J0612AGA1 RM# Number Conc. (µg/mL) 1000.0 8 Purity (%) 0.10 63.7 38 Weight (g) 6.27992 Weight (g) Conc. (µg/mL) 6.27998 1000.0 +/- (µg/mL) 2.0 7761-88-B CAS# 10 ug/m3 Z 3151 NIST SRM

[1] Spectrum No.1 [14.044 sec]:58147.D# [Count] [Linear]

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							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	4 0.02	S:	40.02	ď	A 0.02	a	\$0.02
As	40.2	Ç	<0.02	땹	<0.02	In	<0.02	Mg	<0.01	တ္တ	40.02	짜	<0.02	Agr	7	∄	<0.02	<	40.02
Ва	<0.02	రి	40,02	8	<0.02	듁	40.02	Mn	<0.02	Pd	<0.02	R.	40.02	N	40.2	∄	<u>\$</u>	상	<0.02
Ве	40.01	Ω	<0.02	හු	<0.02	ਲੋਂ	40.2	Hg	40.2	Þ	40.02	R	A0.02	Ž,	40,02	ď	♦ 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)	Z _n	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.

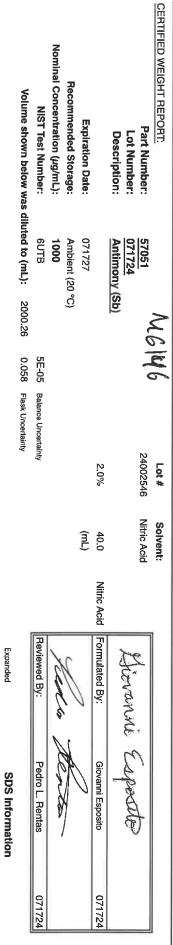
- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
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Compound

Number Part

Number Ę

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/mL) Uncertainty

CAS#

OSHA PEL (TWA)

LD50

NIST SRM

(Solvent Safety Info. On Attached pg.)

Dilution Factor

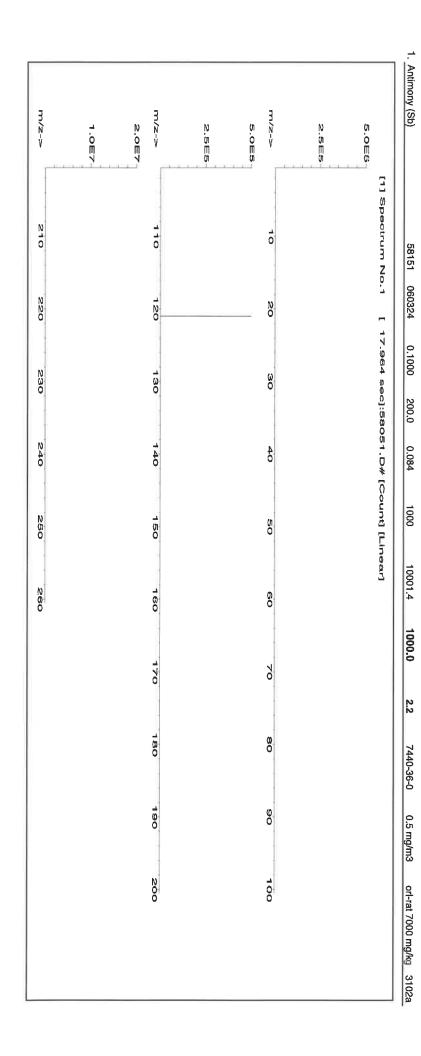
Initial

Uncertainty

Nominal

Initial

Final



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

	l				Н			Trace M	etals	Verifica		by ICP-M	3 <i>t</i> t) S	J/mL)						
1																				
	<u>A</u>	<0.02	δ	<0.02	Dy	<0.02	Hf	<0.02	Ľ	<0.02	Z	<0.02	7	<0.02	Se	<0.2	Тb	<0.02	W	<0.02
	Sb	Т	೧	<0.2	ቪ	<0.02	Но	<0.02	Ľ	<0.02	3	<0.02	Re	<0.02	Si	40.02	Te	<0.02	u	<0.02
	As	<0.2	င္ပ	<0.02	Eu	<0.02	ln	<0.02	Mg	<0.01	õ	<0.02	22	<0.02	A ₆₉	<0.02	⊒	<0.02	<	<0.02
	Ba	<0.02	ß	<0.02	8	<0.02	lr	<0.02	Mn	<0.02	Pd	<0.02	RЬ	<0.02	Na	40.2	∄	<0.02	ΥЪ	<0.02
	Be	<0.01	단	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	×	<0.02
	Bi	<0.02	င	<0.02	ဝွ	<0.02	La	<0.02	Мо	<0.02	ጉ	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	<0.02
	В	<0.02	υ	<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	ďρ								

(I) = larget analyte

Physical Characterization:

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Number: 57051					071724				071724	
Number: 57051										
Number: 57051 24002546 Nitric Acid		1	いっての日子	}	Giovanni Esposito	2	The state of the s	Hends	Pedro L. Rentas	
Number: 57051 24002546 Nitric Acid		1,1	プルガルが	3	Formulated By:	7	1	Leston	Reviewed By:	
Number: 57051 24002546 24002546 271724 24002546 271724 24002546 2400256 24002546 2400256					Nitric Acid					
Number: 57051	Solvent:	Nitric Acid			40.0	(mL)				
Number: 57051	Fot #	24002546			2.0%				Inty	_
Number: 57051									Balance Uncerta	Flask Uncertaint
Number: 57051 Scription: 071724 Autimony ation Date: 071727 d Storage: Ambient (20 n (µg/mL): 6UTB nn below was diluted to (mL):	00								5E-05	0.058
Number: Number: Scription: ation Date: d Storage: n (µg/mL): rt Number:	10×			(qs)			့			
Part Number: Lot Number: Lot Number: Description: Expiration Date: ended Storage: tration (µg/mL): T Test Number: shown below was		57051	071724	Antimony		071727	Ambient (20	1000	6UTB	diluted to (mL):
E RECOMM IOMINAL CONCENT OMINAL CONCENT NIS	CERTIFIED WEIGHT REPORT:	Part Number:	Lot Number:	Description:		Expiration Date:	Recommended Storage:	Nominal Concentration (µg/mL):	NIST Test Number:	Volume shown below was

NIST SRM

LD50

(Solvent Safety Info. On Attached pg.)

OSHA PEL (TWA)

CAS#

+/- (µg/mL) Uncertainty Expanded

Conc. (µg/mL) Conc. (µg/mL)

Vol. (mL) Pipette (mL) Conc. (µg/mL)

Uncertainty

Initial

Dilution

Factor

Number Ľ

Number Part

Compound

SDS Information

1. Antimony (Sb)	58151	060324	0,1000	200.0	0.084	1000	10001.4	1000.0	2.2	7440-36-0	0.5 mg/m3	orl-rat 7000 mg/kg 3102a
5.0E5	[1] Spectrum No.1		17.964 se	9c]:5805	1.D# [C	[17.964 sec]:58051.D# [Count] [Linear]	eari					
2.68												
m/z->> 5.0E5 2.5E5	0	ON	08		0	Og	09	0		08	06	00
m/z->-	011	08 -	130		041	150	160	170		180	000	0 0 8
ν-z/ш	21,0	220	230		240	250	260					

Certified Reference Material CRM



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

							Trace M	letals	S Verifical	tion	by ICP-N	n) SV	a/mF)						
					200				STATE OF THE PARTY OF									ı	
Al	<0.02	25	<0.02	Δ	<0.02	HŁ	<0.02	ΙΞ	<0.02	ï	<0.02	본	<0.02	Se	<0.2	al l	<0.02	*	<0.02
Sb	Τ	ర	<0.2	Er	<0.02	Но	<0.02	2	<0.02	₽ R	<0.02	Re	<0.02	Si	<0.02	Тe	<0.02	n	<0.02
As	<0.2	රී	<0.02	强	<0.02	In	<0.02	Mg	<0.01	ő	<0.02	Rh	<0.02	Ag	<0.02	E	<0.02	>	<0.02
Ba	<0.02	చ	<0.02	8	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Za	<0.2	Th	<0.02	χp	<0.02
Be	<0.01	ڻ	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Ь	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Ā	<0.02
Bi	<0.02	ပိ	<0.02	ő	<0.02	La	<0.02	Mo	<0.02	盂	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Çn	<0.02	Αn	<0.02	Pb	<0.02	PN	<0.02	M	<0.2	Sc	<0.02	Та	<0.02	Ε	<0.02	Zr	<0.02

(T) = Target analyte

Certified by:

Physical Characterization:

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



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

Lot # 071724

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

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			် (၄)						
Purity Uncertainty Assay		0.10 Flask Uncertainty	5E-05 Balance Uncertainty				2%			Solvent:	
Target						(mL)	40.0			Solvent: 24002546	Lot #
Actual							Nitric Acid			Nitric Acid	
Actual											
Uncertainty	Expanded		Reviewed By:	Juna	1		Formulated By:	4	TO SE	>	
(Solvent Safety Info. On Attached pg.)	SDS Information		Pedro L. Rentas	" freshies	A A		Aleah O'Brady	0	San O Basin	7	
ched pg.) NIST			062724				062724			,	
7											

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

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

CAS#

OSHA PEL (TWA)

LD50

SRM

-z/m	5.0E5	1.0E6	m/z->	5000	1.0€4	1.0E6	2.OE6	
N			-1				El opegrum No.	
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220			120		N O			
							4 0	
230			130		9		[]4.044 sec]:57081.D# [Count] [Linear]	
240			<u> </u>		4		57081.	
ō			140		40		<u> </u>	
250			1		OI.			
0			160		60			
			4		70			
			170		0			
			180		80			100
			190		90			or any
			200		100			
			ŏ		ŏ			See all see al
								0

Part # 57081



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

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

		Œ	10	<u>.</u>	Ве	t s	됐 S	AS		Sb		ΔI			
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		7	La	,	Ţ ^j	=	•	b'	24.0	E S	H			_	4
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		Ž	Mo	21.1	E .	M	q	¥ ₽	7.0	Ī	Ē			SIP	1
(T) = Target analyte	20.02	3	& 20.02	100	3	40.02		<u>A</u>	20.02	3	40.02			Verifica	7
et anal	F	4 .	7	7	J	Pd	Ş	<u>۾</u>	NO	Í	3		I	TON	
yte	2.05	b	<u>\$</u>	20,02	Š	<0.02	10,02	3	20.02	3	<u>8</u>			by ICP-	
	Sc	,	S E	2	1	2	1	D.	Ke	;	7		١	₹ 7	
	A0.02	0.02	3	20.02	2	< 0.02	10.04	3	40,02		8		K	a/mL)	
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	40.02	20.02	3	<u>\$</u>	70.02	3	∆ .02		A 22	20.02	20.00	DISTRIBUTION OF THE PERSON			

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).

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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 Solvent:

24002546 Nitric Acid

Expiration Date: Description: 062427 Vanadium (V) 2.0% (mL) 40.0

Nitric Acid

Formulated By:

Aleah O'Brady

062424

062424

AND CORDA

Recommended Storage: **6UTB** 1000 Ambient (20 °C) 5E-05 **Balance Uncertainty**

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): **NIST Test Number:** 2000.3 0.06 Flask Uncertainty Reviewed By: Expanded Pedro L. Rentas **SDS Information**

orl-rat 58.1mg/kg 3165	2.2 7803-55-6 0.05 mg/m3	7803-55-6	2.2	1000.0	1 11	1000	0.084	0.1000 200.0	1 1	58123 021224	58123	Ammonium metavanadate (V)
	# OSHA PEL (TWA)	CAS#	+/- (ua/mL)	Conc. (ua/mL) +/- (ua/mL)	Conc. (ua/mL)	Vol. (mL) Pipette (mL) Conc. (ua/mL)	Pipette (mL)	Vol. (mL)	Factor	Number	Number	Compound
Attac	(Solvent Safety Info. On Attached pg.)	(Solver	Uncertainty	Final	Initial	Nominal	Uncertainty	Initial	Dilution	Lot	Part	

m/z->	2,588	5.0E8	1.0E7	m/z->	1.000	2.006
0 10		110		ō		
220		200		22.0		
230		130		90		
240		140		<u>A</u> .		
250		50		5		2
260		160		60		
		170		8		
		TEC		90		
		190		90		
		200		100		

Part # 57023

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

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	3	<u>.</u>	737	5	rī.	Но	H			
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	6.65 6.65 6.65 6.65 6.65 6.65 6.65 6.65	2 6	3 6	3 ·	-) {	A 22	∆ 0.02	THE STREET, ST		

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