

Prep Standard - Chemical Standard Summary

Order ID :	Q1984	
Test :	SPLP Mercur	y,SPLP MetalGroup3
Prepbatch ID :	PB167960,PB1	67978,
Sequence ID/Qc Bat	chID: LB	135763,LB135886,LB135893,

Standard ID :

MP85156,MP85240,MP85241,MP85242,MP85243,MP85577,MP85579,MP85580,MP85581,MP85582,MP85583,MP85584,MP85592,MP85594,MP85595,MP85602,MP85604,MP85605,MP85606,MP85607,MP85608,MP85641,MP85642,MP85643,MP85644,MP85644,MP85645,MP85644,MP85645,MP856564,MP85655,MP85655,MP85656,MP856557,MP856558,MP856559,

Chemical ID :

M4251,M4465,M4916,M5062,M5305,M5470,M5520,M5658,M5697,M5739,M5751,M5798,M5799,M5800,M5801,M 5811, M5815,M5817,M5873,M5874,M5884,M5942,M5961,M5962,M5977,M5981,M6021,M6023,M6025,M6026,M6028,M6030,M6032,M6041,M6055,M6079,M6086,M6127,M6128,M6137,M6142,M6144,M6145,M6146,M6150,M6151,M6153,M615 8,M6159,M6161,W3112,



Recipe ID 170	NAME 1:1HCL	<u>NO.</u> <u>MP85156</u>	<u>Prep Date</u> 04/07/2025	Expiration Date 08/18/2025	Prepared By Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
<u>FROM</u>	1250.00000ml of M6151 + 1250.000	1 00ml of W31	12 = Final Qu	uantity: 2500.00	0 ml			

Recipe ID 3965	NAME 2:1 H2SO4 : HNO3	<u>NO.</u> MP85240	Prep Date 04/16/2025	Expiration Date 10/16/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
FROM	1600.00000ml of M6041 + 800.0000	0ml of M615	58 = Final Qua	antity: 3200.00	D ml			



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Metals STANDARD PREPARATION LOG

Recipe ID 65	NAME POTASSIUM PERMANGANATE SOLUTION 5 %	<u>NO.</u> MP85241	Prep Date 04/16/2025	Expiration Date 10/16/2025		<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	Sarabjit Jaswal
FROM	100.00000gram of M4916 + 2000.00	000ml of W3	3112 = Final (Quantity: 2000.	000 ml		

Recipe				Expiration	Prepared			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
66	POTASSIUM PERSULFATE	<u>MP85242</u>	04/16/2025	08/06/2025		METALS_SCA		
	SOLUTION 5 %					LE_3 (M SC-3)		04/29/2025
FROM	100.00000ml of M4465 + 2000.0000	0ml of W311	2 = Final Qua	antity: 2000.000) ml			

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Recipe ID 67 FROM	NAME SODIUM CHLORIDE - HYDROXYL- CHLORIDE SOLUTION 2000.00000ml of W3112 + 240.0000	<u>NO.</u> MP85243 Ogram of M4	Prep Date 04/16/2025 4251 + 240.00	Expiration Date 06/25/2025	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3) Jantity: 2000.00	Sarabjit Jaswal 04/29/2025
Recipe ID 1122	NAME ICPMS CALIB BLANK(S0/ICB/CCB)	<u>NO.</u> MP85577	Prep Date 05/05/2025	Expiration Date 05/26/2025	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	Sarabjit Jaswal



Recipe ID 2902 FROM	NAME S8 ICPMS 1.00000ml of M6159 + 2.50000ml of of M6127 + 5.00000ml of M6144 + 76)ml of M6142 +	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3) 5.00000ml of M	ETTE_1 (ICP A)	
<u>Recipe</u> <u>ID</u> 3947	<u>NAME</u> S7(SFAM,6020,200.8)	<u>NO.</u> <u>MP85580</u>	Prep Date 05/05/2025	Expiration Date 05/26/2025		<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	ETTE_1 (ICP	Sarabjit Jaswal
<u>FROM</u>	0.10000ml of M6153 + 1.00000ml of of M6159 + 10.00000ml of M5942 + M5817 + 4.00000ml of M6025 + 4.00 50.00000ml of M5305 + 830.50000m 9.90000ml of M6086 + 9.90000ml of	10.00000ml 000ml of M I of W3112	of M5977 + 1 6032 + 4.9000 + 9.00000ml c	0.00000ml of M 00ml of M5520 of M5751 + 9.00	16158 + 2.0000 + 4.90000ml of 0000ml of M612	0ml of M5815 + M5811 + 5.0000 28 + 9.00000ml o	2.00000ml of 00ml of M6151	-



Recipe ID 3880 FROM	NAME M&B SPIKE-1 5.00000ml of M5470 + 5.00000ml of)ml of M5800 +		ETTE_1 (ICP A) 5961 + 5.0000	
	of M5962 + 5.00000ml of M5981 + 5. 5.00000ml of M6079 + 5.00000ml of	00000ml of	M6021 + 5.00	0000ml of M602	23 + 5.00000ml	of M6028 + 5.0		
Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	ScaleID	PipettelD	Supervised By
3881	M&B SPIKE-2	<u>MP85582</u>	05/05/2025	05/26/2025	Janvi Patel	METALS_SCA LE_3 (M SC-3)	METALS_PIP ETTE_1 (ICP	Sarabjit Jaswal 05/09/2025
FROM	10.00000ml of M5942 + 10.00000ml 2.50000ml of M5799 + 2.50000ml of							nl



Recipe ID 3882 FROM	NAME M&B SPIKE-3 0.62500ml of M6026 + 12.50000ml o Final Quantity: 50.000 ml	<u>NO.</u> <u>MP85583</u> f M5697 + 1	Prep Date 05/05/2025 2.50000ml of	Expiration Date 05/26/2025 M6128 + 12.50	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3) 15 + 11.87500ml	ETTE_1 (ICP A)	
<u>Recipe</u> <u>ID</u> 3900	NAME M&B SPIKE-4	<u>NO.</u> MP85584	Prep Date 05/05/2025	Expiration Date 05/26/2025	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)		Sarabjit Jaswal

 FROM
 6.25000ml of M6086 + 6.25000ml of M6127 + 6.25000ml of M6144 + 6.25000ml of MP85577 = Final Quantity: 25.000 ml



Recipe ID 3948 FROM	NAME S6(SFAM,6020,200.8) 0.50000ml of M6151 + 1.00000ml of	<u>NO.</u> MP85592 M6158 + 48	Prep Date 05/05/2025 3.50000ml of V	Expiration Date 05/26/2025 W3112 + 50.000	Prepared By Janvi Patel	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3) 580 = Final Qua	ETTE_1 (ICP A)	Sarabjit Jaswal 05/09/2025 ml
Recipe ID 3949 FROM	NAME S5(SFAM,6020,200.8) 0.50000ml of M6151 + 1.00000ml of	<u>NO.</u> <u>MP85594</u> M6158 + 73	Prep Date 05/05/2025 5.50000ml of V	Expiration Date 05/26/2025 W3112 + 25.000		ScaleID METALS_SCA LE_3 (M SC-3) 580 = Final Qua	ETTE_1 (ICP A)	Sarabjit Jaswal 05/09/2025



Recipe ID 3954 FROM	NAME S4(SFAM,6020,200.8) 0.50000ml of M6151 + 1.00000ml of	<u>NO.</u> <u>MP85595</u> M6158 + 86	Prep Date 05/05/2025 6.00000ml of V	Expiration Date 05/26/2025 W3112 + 12.500	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3) 580 = Final Qua	ETTE_1 (ICP A)	Supervised By Sarabjit Jaswal 05/09/2025 ml
<u>Recipe</u> <u>ID</u> 3951	NAME S3(SFAM, 6020,200.8)	<u>NO.</u> MP85602	Prep Date 05/05/2025	Expiration Date 05/26/2025	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	ETTE_1 (ICP	Sarabjit Jaswal
FROM	0.50000ml of M6151 + 1.00000ml of	I M6158 + 88	I 3.50000ml of V	N3112 + 10.000		A)	



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Recipe ID 3955	NAME S2CONC(SFAM,6020,200.8)	<u>NO.</u> <u>MP85604</u>	<u>Prep Date</u> 05/05/2025	Expiration Date 05/26/2025	<u>Prepared</u> <u>By</u> Janvi Patel	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	ETTE_1 (ICP	
FROM	0.00500ml of M6153 + 0.05000ml of of M5981 + 0.05000ml of M6023 + 0. 0.05000ml of M6128 + 0.10000ml of of M5799 + 0.25000ml of M5811 + 0. 0.25000ml of M6145 + 0.50000ml of of M6151 + 2.50000ml of M5520 + 2. 230.04500ml of W3112 = Final Quar	05000ml of M5658 + 0. 25000ml of M6032 + 0. 50000ml of	M6025 + 0.05 10000ml of M M5942 + 0.25 50000ml of M M6086 + 2.50	5000ml of M602 5697 + 0.10000 5000ml of M596 6137 + 1.25000	28 + 0.05000ml 0ml of M6146 + 62 + 0.25000ml 0ml of M5815 +	of M6030 + 0.0 0.10000ml of M of M5977 + 0.2 1.25000ml of M	5000ml of M60 6159 + 0.2500 5000ml of M60 5817 + 1.2500	79 + 0ml 21 + 0ml

Recipe	NAME	NO	Dren Data	Expiration	Prepared	SaalalD	DinettelD	Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
3956	S2(SFAM,6020,200.8)	<u>MP85605</u>	05/05/2025	05/26/2025		METALS_SCA		
						LE_3 (M SC-3)		05/09/2025
FROM	0.50000ml of M6151 + 1.00000ml of	M6158 + 98	8.00000ml of V	N3112 + 0.5000	0ml of MP8560	04 = Final Quar	A) htity: 100.000 r	nl



Recipe ID 3957 FROM	NAME S1(SFAM,6020,200.8) 0.50000ml of M6151 + 1.00000ml of	<u>NO.</u> <u>MP85606</u> M6158 + 88	Prep Date 05/05/2025 3.50000ml of V	Expiration Date 05/26/2025 W3112 + 10.000	ScaleID METALS_SCA LE_3 (M SC-3) 605 = Final Qua	ETTE_1 (ICP A)	
Recipe ID 3958	NAME ICV(SFAM)	<u>NO.</u> <u>MP85607</u>	Prep Date 05/05/2025	Expiration Date 05/26/2025	ScaleID METALS_SCA LE_3 (M SC-3)		Sarabjit Jaswal 05/09/2025

FROM 2.00000ml of M6150 + 98.00000ml of MP85577 = Final Quantity: 100.000 ml



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Recipe ID 3961	NAME CCV	<u>NO.</u> MP85608	Prep Date 05/05/2025	Expiration Date 06/02/2025	<u>Prepared</u> <u>By</u> Janvi Patel	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	ETTE_1 (ICP	
FROM	0.20000ml of M6026 + 0.50000ml of of M6137 + 1.00000ml of M5815 + 1. M5811 + 2.00000ml of M6032 + 24.9 + 4.50000ml of M5697 + 4.50000ml of 5.50000ml of M5942 + 5.50000ml of	.00000ml of 5000ml of N of M6128 +	M5817 + 10.0 /6086 + 24.95 4.50000ml of	00000ml of M61 5000ml of M612 M6145 + 4.950	158 + 12.45000 27 + 24.95000n 00ml of M6159	ml of M5520 + 1 nl of M6144 + 25 + 5.00000ml of	2.45000ml of 6.00000ml of M	

<u>Recipe</u>				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
1142	ICSA ICPMS	<u>MP85641</u>	05/05/2025	05/26/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	05/13/2025
FROM	10.00000ml of M5873 + 90.00000ml	of MP85577	I 7 = Final Qua	ntity: 100 000	l l		<u> </u>	50, 10,2020
	10.00000mi 01 M3073 + 90.00000mi	01 101 0007 7		niity. 100.000				



Recipe ID 1143	NAME ICSAB ICPMS	<u>NO.</u> MP85642	Prep Date 05/05/2025	Expiration Date 05/26/2025	<u>Prepared</u> <u>By</u> Janvi Patel	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	10.00000ml of M5873 + 10.00000ml	of M5874 +	80.00000ml c	of MP85577 = F	Final Quantity: 1	00.000 ml		

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
3962	MG 10PPM FOR TUNE	<u>MP85643</u>	05/05/2025	05/26/2025	Janvi Patel	None	METALS_PIP	
							ETTE_3 (A)	05/13/2025
FROM	0.01000ml of M6127 + 9.99000ml of	MP85577 =	Final Quanti	ty: 100.000 ml				



Recipe ID 3894 FROM	NAME TUNE 200PPB 2.00000ml of M6055 + 2.00000ml of	<u>NO.</u> <u>MP85644</u> MP85643 +	Prep Date 05/05/2025 96.00000ml o	Expiration Date 05/26/2025	Prepared By Janvi Patel Final Quantity: 1	ScaleID None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 05/13/2025
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u> MP85645	Prep Date	Expiration Date 05/26/2025	<u>Prepared</u> <u>By</u> Janvi Patel	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP	<u>Supervised By</u> Sarabjit Jaswal



Recipe ID 871	NAME MERCURY INTERMEDIATE B 250PPB WORKING STD.	<u>NO.</u> MP85647	Prep Date 05/13/2025	Expiration Date 05/14/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
<u>FROM</u>	1.00000ml of M6158 + 2.50000ml of	M5062 + 96	50000ml of V	V3112 = Final	Quantity: 100.00	00 ml	A)	

<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	PipettelD	<u>Supervised By</u> Sarabjit Jaswal
1340	Hg 0.00 PPB STD	<u>MP85648</u>	05/13/2025	05/14/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	-
FROM	l 2.50000ml of M6158 + 247.50000ml	of W3112 =	I Final Quantit	l ty: 250.000 ml			A)	30/10/2020



Recipe ID 1341 FROM	NAME Hg 0.2 PPB STD 2.50000ml of M6158 + 247.30000ml	<u>NO.</u> MP85649 of W3112 +	Prep Date 05/13/2025 0.20000ml of	Expiration Date 05/14/2025 MP85647 = F	Prepared By Mohan Bera		<u>PipetteID</u> METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 05/13/2025
<u>Recipe</u> <u>ID</u> 1342	NAME Hg 2.5 PPB STD	<u>NO.</u> MP85650	Prep Date 05/13/2025	Expiration Date 05/14/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_5 (HG	Sarabjit Jaswal



Recipe ID 1343 FROM	NAME Hg 5.0 PPB STD 2.50000ml of M6158 + 242.50000ml	<u>NO.</u> <u>MP85651</u> of W3112 +	Prep Date 05/13/2025 5.00000ml of	Expiration Date 05/14/2025 MP85647 = Fi	Prepared By Mohan Bera inal Quantity: 25	ScaleID None	PipetteID METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 05/13/2025
<u>Recipe</u> <u>ID</u> 1344	NAME Hg 7.5 PPB STD	<u>NO.</u> <u>MP85652</u>	<u>Prep Date</u> 05/13/2025	Expiration Date 05/14/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal



Recipe ID 1345	NAME Hg 10.0 PPB STD	<u>NO.</u> MP85653	Prep Date 05/13/2025	Expiration Date 05/14/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
<u>FROM</u>	2.50000ml of M6158 + 237.50000ml	of W3112 +	10.00000ml c	of MP85647 = I	Final Quantity: 2	250.000 ml	A)	
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipettelD</u>	<u>Supervised By</u> Sarabjit Jaswal

Recipe				Expiration	Prepared			<u>Supervisea By</u>
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
1346	Hg ICV SOLUTION	<u>MP85654</u>	05/13/2025	05/14/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	05/13/2025
FROM	2.50000ml of M6158 + 2.50000ml of	M6161 + 24	5.00000ml of	W3112 = Fina	I Quantity: 250.0	000 ml	- <u>A)</u>	
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Recipe ID 1351	NAME ICB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> MP85655	Prep Date 05/13/2025	Expiration Date 05/14/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
FROM	2.50000ml of M6158 + 247.50000ml	of W3112 =	Final Quantit	ry: 250.000 ml			Α)	
Recipe				Expiration	Prepared			Supervised By

<u>Recipe</u>				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
1358	CCV (Hg 5.0 PPB SOLUTION)	<u>MP85656</u>	05/13/2025	05/14/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG A)	05/13/2025
FROM	485.00000ml of W3112 + 5.00000ml	of M6158 +	10.00000ml c	of MP85647 =	Final Quantity: 8	500.000 ml	~)	



Recipe ID 1352	NAME CCB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> MP85657	Prep Date 05/13/2025	Expiration Date 05/14/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
<u>FROM</u>	495.00000ml of W3112 + 5.00000ml	of M6158 =	Final Quantit	ty: 500.000 ml			A)	
<u>Recipe</u> <u>ID</u>	NAME	NO.	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	PipettelD	Supervised By

<u>Recipe</u>				Expiration	<u>Prepared</u>			<u>Supervised By</u>
ID	NAME	<u>NO.</u>	<u>Prep Date</u>	Date	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	<u>MP85658</u>	05/13/2025	05/14/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	
	·	of \W/2112 +	0.20000ml of	MD95647 - 5	inal Quantity: 25	50.000 ml	A)	05/13/2025
<u>FROM</u>	2.50000ml of M6158 + 247.30000ml	of vv3112 +	0.20000ml of	MP85647 = F	inal Quantity: 25	50.000 mi		



Recipe ID 1350	NAME CHK STD (Hg 7.0 PPB SOLUTION)	<u>NO.</u> MP85659	Prep Date 05/13/2025	Expiration Date 05/14/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
<u>FROM</u>	2.50000ml of M6158 + 240.50000ml	I of W3112 +	1.00000ml of	MP85647 = F	inal Quantity: 2	50.000 ml	A)	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	12/19/2018 / mohan	12/05/2018 / mohan	M4251
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3238-05 / Potassium Persulfate (2.5kg)	0000234156	08/06/2025	07/23/2019 / mohan	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 #
Inorganic Ventures	6020CAL-1 / Calibration Standard Method 6020	S2-MEB711244	10/20/2026	03/07/2025 / JANVI	04/01/2022 / jaswal	M5305
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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	082922	08/29/2025	04/14/2025 / jaswal	03/16/2023 / jaswal	M5470



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	120822	12/08/2025	08/01/2024 / Jaswal	03/17/2023 / bin	M5520
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	060523	06/05/2026	08/28/2023 / jaswal	08/25/2023 / jaswal	M5658
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	102523	10/25/2026	04/03/2024 / jaswal	10/27/2023 / jaswal	M5697
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	6020ISS / 6020ISS, 10 ug/ml, Bi, Ho, In, 6Li, Rh, Sc, TB, Y	T2-MEB709511	09/03/2026	08/07/2024 / jaswal	04/11/2022 / jaswal	M5739
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	071723	07/17/2026	10/01/2024 / Jaswal	08/25/2023 / jaswal	M5751
Supplier	ItemCode / ItemName	Lot #	Expiration	Date Opened /	Received Date /	Chemtech

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	102523	10/25/2026	02/09/2024 / bin	02/09/2024 / bin	M5798



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



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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICPMS) STOCK SOLN	CP-MS ICSA-0803	05/31/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5873
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSB (ICPMS) STOCK SOLUTION	CP-MS ICSB-0803	05/31/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5874
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000281938	07/06/2026	04/30/2024 / mohan	04/25/2024 / mohan	M5884
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGTI1-1 / TITANIUM 125mL 1000ug/mL	T2-TI719972	06/17/2027	06/18/2024 / Jaswal	02/22/2024 / Jaswal	M5942
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57028 / Ni, 1000 PPM, 125 ml	041124	04/11/2027	07/02/2024 / Jaswal	06/11/2024 / Jaswal	M5961
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	060624	06/06/2027	07/02/2024 / Jaswal	06/14/2024 / Jaswal	M5962



Standards, Inc.

125 ml

CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGMO1-1 / MOLYBDENUM 125mL 1000ug/mL	T2-MO720876	07/17/2027	01/16/2025 / JANVI	02/22/2024 / Jaswal	M5977
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57092 / U, 1000 PPM, 125 ml	060724	06/07/2027	07/29/2024 / Jaswal	06/11/2024 / Jaswal	M5981
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	062424	06/24/2027	09/28/2024 / jaswal	08/05/2024 / Jaswal	M6021
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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	57182 / Pb, 10000 PPM,	110923	11/09/2026	12/05/2024 /	08/05/2024 /	M6026

janvi

Jaswal



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	070124	07/01/2027	08/05/2024 / kareem	08/05/2024 / Jaswal	M6028
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	122823	12/28/2026	08/05/2024 / kareem	08/05/2024 / Jaswal	M6030
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	010924	01/09/2027	01/14/2025 / Jaswal	08/05/2024 / Jaswal	M6032

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9673-33 / Sulfuric Acid, Instra-Analyzed (cs/6c2.5L)	23D2462010	03/20/2028	08/16/2024 / mohan	08/16/2024 / mohan	M6041

ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
TUNING SOLUTION,	U2-MEB734294	06/21/2028	08/21/2024 / Jaswal	08/19/2024 / Jaswal	M6055
	IV-STOCK-12 / ICP-MS	IV-STOCK-12 / ICP-MS U2-MEB734294 TUNING SOLUTION,	ItemCode / ItemNameLot #DateIV-STOCK-12 / ICP-MS TUNING SOLUTION,U2-MEB73429406/21/2028	ItemCode / ItemNameLot #DateOpened ByIV-STOCK-12 / ICP-MS TUNING SOLUTION,U2-MEB73429406/21/202808/21/2024 / Jaswal	ItemCode / ItemNameLot #DateOpened ByReceived ByIV-STOCK-12 / ICP-MS TUNING SOLUTION,U2-MEB73429406/21/202808/21/2024 / Jaswal08/19/2024 / Jaswal

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.	58112 / Mg, 10000 PPM, 500 ml	112124	11/21/2027	01/13/2025 / kareem	01/13/2025 / kareem	M6127
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	101124	10/11/2027	01/13/2025 / kareem	01/13/2025 / kareem	M6128
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGSI1-1 / SILICON 125mL 1000ug/mL	V2-SI744713	07/10/2029	01/14/2025 / Jaswal	10/03/2024 / Jaswal	M6137
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	103024	10/30/2027	05/06/2025 / JANVI	01/13/2025 / Jaswal	M6142
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	072424	07/24/2027	01/23/2025 / kareem	01/13/2025 / Jaswal	M6144



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	121724	12/17/2027	02/04/2025 / 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 #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV1-1014	07/07/2025	02/07/2025 / JANVI	04/20/2021 / JANVI	M6150

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22G2862015	08/18/2025	02/18/2025 / Sagar	01/15/2025 / Sagar	M6151

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGSR10 / Strontium (SR), 125mL 10,000ppm	V2-SR754329	02/28/2026	02/28/2025 / JANVI	01/07/2025 / JANVI	M6153

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	03/25/2029	03/10/2025 / Eman	02/02/2025 / Sagar	M6158



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / AI, 10000 PPM, 500 ml	011325	03/18/2026	03/18/2025 / kareem	02/09/2025 / kareem	M6159
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-5 / ICV (HG)STOCK SOLN	ICV 5 0415	07/31/2025	05/01/2025 / mohan	03/30/2024 / mohan	M6161
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	DIW / DI Water	Daily Lab-Certified	07/03/2029	07/03/2024 / Iwona	07/03/2024 / Iwona	W3112

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

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Certified Reference Material CRM



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

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

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Physical Characterization:

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

In P. S.

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 57056 Lot # 010924

Part # 58120 Lot #	m/z->	а. СП-4	1.065	m/z->	2.5 1 4	5.0E4	FT/Z->>	1.0E4	2.004	1. Calcium carbonate (Ca)	Compound	Weight shown	Recommended Storage: Nominal Concentration (µg/mL):	Expira	Part Lot De	CERTIFIED WEIGHT REPORT:		Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Lot # 082324	N			1 10			10		[1] Spectrum No. 1	IN014 CAD032023B3	RM# Nu	Weight shown below was diluted to (mL):			Part Number: 58120 Lot Number: 082324 Description: Calciun			s, Inc.
	220			120 130			20 30			10000	Lot Nominal P Number Conc. (µg/mL) (4000.1)))))	327	<u>58120 082324 Calcium (Ca)</u>		Rev	V
	240			140			40		12.514 sec]:58120.Dŵ [Count] [Linear]	99.999 0.10 39.9	Purity Uncertainty Assay (%) Purity (%) (%)	0.15 Flask Uncertainty		2%	Solvent		Revel = 10/14/2024	Certified Ref
1 of 2	250			150			50		ount] [Linear]	100.2537 100.2656	Target Actual Weight (g) Weight (g)			80.0 Nitric Acid (mL)	46	Lot #	M 6085 / M	Certified Reference Material CRM
	280			160 170			80 70			656 10001.2	Actual Conc. (µg/mL)					1	M6086/M6087	CRM
Prin				180			80			20.0 471-34-1	Expanded Uncartainty (Solve +/- (µg/mL) CAS#		8	Formulated By: 0	wie.		(
Printed: 10/10/2024, 5:43:17 PM				190			90 10			5 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50		Vertas	Giovanni Esposito	Especto		riups.//	ANAB AR-1
43:17 PM				200			100			ort-rat >2000mg/kg 3109a	n ached pg.) NIST LD50 SRM	COLOCT	0000004	082324			rittps.//Absolutestarioards.com	ANAB ISO 17034 Accredited AR-1539 Certificate Number

Printed: 10/10/20	Part # 58120 Lot # 082324 2 of 2	 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are 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). 	Homogeneity: No heterogeneity was observed in the preparation of this standard.	Physical Characterization:	(T) = Target analyte	Al 4002 Cd 4002 Dy 4002 Hf 4002 Li 4002 Ni 4002 Sb 40.02 Ca T Er 40.02 H 40.02 Li 40.02 Ni 40.02 As 40.2 Ca T Er 40.02 Ho 40.02 Li 40.02 Nb 40.02 Ba 40.02 Ca 40.02 Eu 40.02 In 40.02 Mg 40.01 Os 40.02 Ba 40.02 Ca 40.02 Gd 40.02 Ir 40.02 Mg 40.02 Nb 40.02 Ba 40.02 Ca 40.02 Gd 40.02 Fr 30.0 Hg 40.02 Pd 40.02 Bi 40.02 Ca 40.02 Ge 40.02 Fr 30.0 Hg 40.02 Pd 40.02 Bi 40.02 Ca 40.02 Au	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS): Trace Metals Verification by ICP-MS	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
3 Certifi 3 Solutest 3 0 02 3 02 3	Printed: 10/10/2024, 5:43:17 PM	s otherwise stated. laterials are used in (see above). ertainty of NIST 994).	For P. S.	Certified by:		$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1 T 1 T 1	RM ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

m/z->	1.067	m/z-> 2.0€7	5.014	m/z-> 1.0E5	2.5E4	5. 0 114	1. Cadmium nitrate tetrahydrate (Cd)	Compound	Weight shov	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):		CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
		 		0 0		[1] Spectrum No.1		RM#	Weight shown below was dliuted to (mL):	Expiration Date: nended Storage: ntration (µg/mL):	Part Number: Lot Number: Description:	PORT:	15, Inc. om
		120		20		-	IN024 CDM092021A1	Lot Number	6UTB uted to (mL):	070127 Ambient (20 °C) 1000	<u>57048</u> <u>070124</u> Cadmium (Cd)		
		130		30		12.514 800	1000 99.	Nominal Pu Conc. (µg/mL) (1	2000.07 0.1		(Cd)		R
200		140		\$		12.514 sec]:58148.D# [Count] [Linear]	99.999 0.10 36.5	Purity Uncertainty Assay (%) Purity (%) (%)	5E-05 Balance Uncertainty 0.100 Flask Uncertainty		Solvent: 2%		Certified R
		1 () ()		ő		Count] [Line	.5 5.4797	say Target 6) Weight (g)	ţ		ent: 24002546 2% 40.0	Lot #	Certified Reference Material CRM 3 15 12 4
		160		0 O		ar]	5.4804	Actual Actual Weight (g) Conc. (µg/mL)			Nitric Acid		terial CRM
		170		70			1000.1	11	Re	5	5		M6028
		-1 2 C		BO			10022-68-1	Expanded Uncertainty (Solvent +/- (µg/mL) CAS# 0	Reviewed By: Ped	\$	Alloch & B		-
		190 200		90 100				SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD51	Pedro L. Rentas	ento	Brack		ANAB IS AR-153 https://Ab
				-			orl-rat 60.2mg/kg 3108	hed pg.) NIST LD50 SRM	070124		070194		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

1 of 2

Part # 57048

Lot # 070124

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

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

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Physical Characterization:

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

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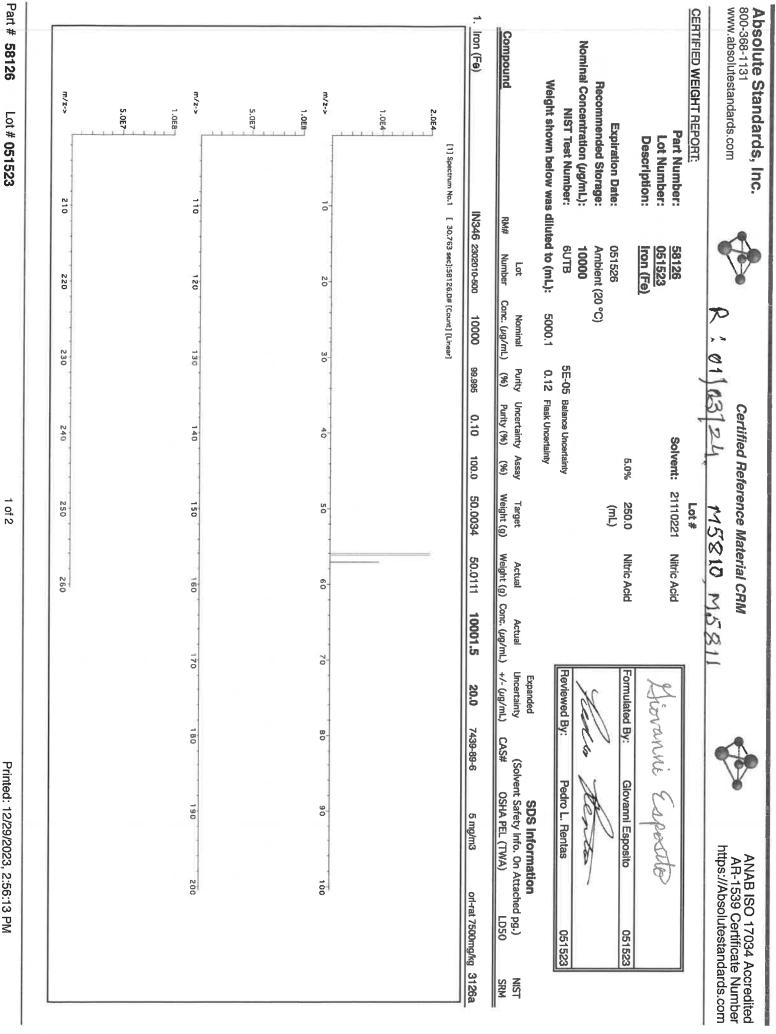
Certified by:

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- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST

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

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11. 2015 BT 70000 an	4002 C: 4002 Fe 4		Trace Metals Verification by ICP-MS (µg/mL)	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Description Descring <thdescring< th=""> Descring <thd< th=""><th></th></thd<></thdescring<>	
	(T) = Target analyte	(T) = Target analyte	(T) = Target analyte	Is Verification by ICP-MS (µg/mL) 4002 Ni 40.0 Pi Mi Mi Mi Mi	etrometry (ICP-MS): Is Verification by ICP-MS (μ g/mL) $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	trified Reference Material CRMCtrometry (ICP-MS):Is Verification by ICP-MS (µg/mL) 4002 Ni 402 Ni 402 4002 Ni 402 Re 402 32 4002 Re 402 32 32 402 402 Re 402 32 32 402 402 Re 402 32 32 402 402 Re 402 32 32 402 1 402 32 32 33 402 1 402 32 32 32 32 1 402 32 32 33 402 1 <t< th=""></t<>

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

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

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

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B	A0.02	S	<0.02	ନ୍ନ	<0.02	5	<0.02	Mo	<0.02	7	<0.02	Sm	<0.02	60	40.02	5	<0.02	Zn	Ang N
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Physical Characterization:

(T)= Target analyte

Certified by:

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

Son P. Shirt

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Weight shown below was diluted to (mL): 2000.02 0.058 Flax Uncertainty Asay Compound Intel (Pb) IN029 Resizented Conc. (ug/mL) Puity (N0) Puity (N0)	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL); NIST Test Number:
IN029 PBD/IZ01641 10000 99.999 10 20 30 30 30 30 110 120 30 30 210 120 130 130 130	NIST Test Number: Weight shown below wa
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Lot # 110923

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

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As	4 0.2	ĉ	<0.02	E	<0.02	6	<0.02	Mg	<0.01	õ	<0.02	R	<0.02	Ag	40.02	H	40.02	<	20.02
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Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent Suitable for Mercury Determination (hydroxylammonium chloride)

M4251





Material No.: 2196-01 Batch No.: 0000215387 Manufactured Date: 2018/06/27 Retest Date: 2025/06/25 Revision No: 1

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

Certificate of Analysis Meets ACS Reagent Chemical Requirements,

For Laboratory, Research or Manufacturing Use

Country of Origin: CN Packaging Site: Paris Mfg Ctr & DC



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

James Techie Jamie Ethier

Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone: 610.386.1700 Certificate of Analysis **ThermoFisher** S C I E N T I F I C

M4913-16

Page 1 of 1

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 Buston

Julian Burton - Quality Control Manager - Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701. *Based on suggested storage condition.



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%
CERTIFIED VALUES	AND UNCERTAINTIES

Certified Value:	10.001 ± 0.053 μg/mL
Density:	1.020 g/mL (measured at 20 \pm 4 °C)

Assay Information:

3.0

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
Hg	Calculated		See Sec. 4.2

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

0	Ag		0.000011	M	Eu	<	0.000201	0	Na		0.000004	М	Se	<	0.015915	0	Zn	<	0.001510
0	AI		0.000001	0	Fe		0.000001	М	Nb	<	0.000201	0	Si		0.000005	М	Zr	<	0.000201
Μ	As	<	0.000402	Μ	Ga	<	0.000201	Μ	Nd	<	0.000201	М	Sm	<	0.000201				
М	Au	<	0.003631	М	Gd	<	0.000201	M	Ni	<	0.000402	M	Sn	<	0.001007				
Μ	В	<	0.001208	М	Ge	<	0.000201	М	Os	<	0.000605	М	Sr	<	0.000201				
Μ	Ba	<	0.000201	Μ	Hf	<	0.000201	0	Ρ	<	0.032370	M	Та	<	0.000201				
Μ	Be	<	0.000201	s	Hg	<		Μ	Pb	<	0.000201	M	Tb	<	0.000201				
Μ	Bi	<	0.000201	М	Ho	<	0.000201	Μ	Pd	<	0.000403	М	Te	<	0.002216				
0	Ca		0.000007	Μ	In	<	0.000201	Μ	Pr	<	0.000201	М	Th	<	0.000201				
M	Cd	<	0.000201	М	lr	<	0.000201	Μ	Pt	<	0.000402	M	Ti	<	0.000402				
Μ	Ce	<	0.000201	0	Κ		0.000020	М	Rb	<	0.000201	0	ΤI	<	0.016508				
M	Co	<	0.000201	М	La	<	0.000201	Μ	Re	<	0.000201	Μ	Tm	<	0.000201				
0	Cr	<	0.003021	0	Li	<	0.000107	М	Rh	<	0.000201	М	U	<	0.008058				
М	Cs	<	0.001208	М	Lu	<	0.000201	Μ	Ru	<	0.000201	Μ	V	<	0.000201				
М	Cu	<	0.000402	0	Mg		0.000001	0	S	<	0.053950	М	W	<	0.000604				
M	Dy	<	0.000201	M	Mn	<	0.000604	М	Sb	<	0.001208	М	Y	<	0.000201				
Μ	Er	<	0.000201	М	Мо		0.000009	М	Sc	<	0.000201	М	Yb	<	0.000201				

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

Ulya new

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

1.026 g/mL (measured at 20 \pm 4 °C)

Density:

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

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

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 20, 2021

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

11.2 Lot Expiration Date

- October 20, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line

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

Part # 58119 Lot # 120822

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

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m/z->	N.5 6	m/z-≯ 5.0E5	ភ. ០ ពេស	m/z-> 1.0≣6	5000	1.0트4	1. Chromium(III) nitrate nonahydrate (Cr)	Compound	Volume sho	Expiration Date: Recommended Storage: Nominal Concentration (Jug/mL):	Par De	CERTIFIED WEIGHT REPORT:	www.absolutestandards.com
N 10		110		1		[1] Spectrum No.1		Pa	Volume shown below was diluted to (mL):	Expiration Date: nended Storage: ntration (µg/mL):	Part Number: Lot Number: Description:	0	3
220		120		N. O		-	58124 071122	Part Lot Number Number	filuted to (mL):	060526 Ambient (20 °C) 1000	<u>58024</u> 060523 Chromium (Cr)		A
230		130		ů. O		31,393 80	0.1000	Dilution Factor	2000.02		1 (Cr)		MS
240		140				c]:57024.	200.0 0.084	Initial Uncertainty Vol. (mL) Pipette (mL)	0.058 Flask U				MS658
				ð.		31,393 sec]:57024.D# [Count] [Línear]	084 1000	Uncertainty Nominal Pipetta (mL) Conc. (µg/mL)	Flask Uncertainty		21110221 2.0%	Lot #) A
N 50		1 の の		S		t] [Linear]	10 10000.1	nał Initial g/mL) Conc. (µg/mL)		(mL)	221 Nitric Acid % 40.0	# Solvent:	
200		160		0		ş	0.1 1000.0	al Final rg/mL) Conc. (µg/mL)		Ľ	Acid .0 Nitric Acid	ent:	123
		170		70			0.0 2.2	Expanded al Uncertainty ig/mL) +/- (µg/mL)	Lineviewed by.	X	Acid Formulated By:		1
		180		8- 0-		1	7789-02-8) CAS		a la	Horner		
		190		Ŷ				jolvent Os		ten	Lawrence Barry		Y
		20- 00-		100			0.5 mg(Cr)/m3 ort-	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		Ø	nce Barry		AH-15: https://Ab
		0		o			ort-rat 3250 mg/kg	ched pg.) LDS0	00000	00050	060523		AH-1539 Certificate Number https://Absolutestandards.com
							g 3112a	NIST		٥ <u> </u>	[ω]	1	te Numbe dards.com

Part # 58024 Lot # 060523

1 of 2

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Absolute Standards, Inc. Certified Reference 800-368-1131 Image: Certified Reference www.absolutestandards.com Image: Certified Reference Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	andards.cor	s by Indu	ictive	y Coupled	Plasn	na Mass S	Spectr C	Certified Reference Material Ci	ICP-M	IS):	ateria	I CRM					¥	크	ANAB AR-11 ttps:///	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	034 Acc lificate N standar	lumbe ds.corr
the stype of the style						Trace N	Metals	s Verification	ation	হ	ICP-MS		/g/mL)									
AI <0.02		40,02	Dv	40.02	H	<0.02	E	40.02	- N	- -	20		A) 02	8	a)	-	-			3		
		40.02	Er Dy	<0.02	Ho	<0.02	달드	4)02 4)02	N N	A0.02	88	<u>ም</u> ፡	40.02 0.02	<u>8</u> %	40.02 00.02	ਜ ਸ	4 4	c ¥		<0.02		
	_	<0.02	말	<0.02	5	<0.02	Mg	<0.01	² 0	<0.02	.02	Rh	40.02	Ag	<0.02	1	<0.02			<0.02		
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Physical Characterization:	aracteriz	ation:															C	Certified by:	by:		a	
Homogeneity: No heterogeneity was observed in the preparation of this standard.	No heteroge	meity was o	observe	d in the preps	aration (of this stand	lard.										1	14	1		ľ	
 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	ad value is ds, 18.2 n ation of all are prepar are prepar are certife ds should ds should ent Result.	he conc megohm d Ill standarc are me ars are me are are are me ars are me ars are me ars are me ars are me ars are me are are are me are are are me are	entrat leioniz ls. sticulou etrica .5% of .5% of .5	ed water, c ed water, c usly cleane ully using ba f the state f the state f the state and Kuyat, a Note 122	ted fro calibrat d prior alanced d value and un and un 97, U.S	red Class, ted Class, that are that are that are der appro Guideline Guideline	A glass A glass calibra priate s for E nent P	nd volume sware and ited with ites stated laborator, ivaluating vinting Off	the hi weight cond y cond fice, W	ighest p ighest p is trace itions. xpressir /ashingt	ments ourity able tr able the ton, D.	unless raw m raw m NIST 0 NIST 0. C. (19	materials are used in Materials are used in ST (see above). ertainty of NIST 1994).	se stat re usec vve). NIST	n .							

Part # 58024 Lot # 060523

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT:		Ex	Recommended Storage: Nominal Concentration (µg/mL):	NIST	Volume s	Compound	1. Copper(II) nitrate trihydrate (Cu)	1.0E8	5.0E5	m/z->	2.5E7	m/z-≻ 2.0€7	1.0€7	m/z->
om as, Inc.		Part Number: Lot Number: Description:	Expiration Date:	Recommended Storage: Concentration (µg/mL):	NIST Test Number:	Volume shown below was diluted to (mL):	z				10		110		2
-		58029 102523 Copper (Cu)	102526	Ambient (20 °C) 1000	6UTB	t diluted to (mL)	Part Lot Number Number	58129 100223			N		120		
		(Cu)		20 °C)		2000.02	Dilution Factor	0.1000			30		130		
Certif					5E-05 Balance	0.058 Flask U	Initial Uncertainty Vol. (mL) Pipette (mL)	200.0 0.084			4°		140		
ified Referen M569子	Lot #	24002546	2.0%		Balance Uncertainty	Flask Uncertainty	Initial Uncertainty Nominal Vol. (mL) Pipette (mL) Conc. (µg/mL)	84 1000			50		150		
Certified Reference Material CRM M 56 G子 R いり0/2	Solve	46 Nitric Acid	40.0 (mL)				Initial nL) Conc. (µg/mL)	10000.1			80		0 160		
1 CRM 10 27 23		L	Nitric Acid				Final L) Conc. (µg/mL)	1000.0	894	tinna an	paine dissipsion of the design		0 170		
			Formulated By:	Mg .	Reviewed By:		cxpanoed Uncertainty +/- (µg/mL)	2.2			70				
-		and and		to the	-70		(Solven CAS# C	10031-43-3			8 0		180		
http:			Benson Chan	and a	Pedro L. Rentas		(Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50	1 mg/m3			90		190		
ANAB ISO 17034 Accreditec AR-1539 Certificate Number https://Absolutestandards.com			102523	,	102523		Attached pg.)	ori-rat 794 mg/kg			100		N 0		
Accredite ate Numbe Idards.com	4		23		ដ្រ		NIST	3114							

www.absolutestandards.com 300-368-1131 Absolute Standards, Inc.



Certified Reference Material CRM



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

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

Γ							Trace M	etals	; Verifica	ition	by ICP-N	r) SI	g/mL)						
	3	2	22	7	2		2	and the second		Sale Con	Constraint for the		Sector Sector Sector	March	Contraction of the other				The second second
A	40.02	8	20,02	Dy	<0.02	Hf	<0.02	5	<0.02	N	<0.02	Pr	<0.02	Se.	<0.2	5	<0.02	W	<0.02
SB	40.02	ß	<0.2	Ę	<0.02	Ho	<0.02	Ŀ	<0.02	ß	<0.02	Re	<0.02	2	<0.02	ī	<0.02	c	<0.02
As	40.2	ů	<0.02	F	<0.02	F	<0.02	Mg	<0.01	õ	A0.02	Rb	A0.02	Ag	40.02	3	40.02	<	4002
Ba	<0.02	S	<0.02	ନ୍ଥ	<0.02	5	40.02	Mb	<0.02	Pd	<0.02	Rb	A).02	Na	40 i2	đ	<0.02	\$	40.02
Be	<0.01	ዮ	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	'n	<0.02	Ru	<0.02	Sr	40.02	j	<0.02	ĸ	40.02
Bi	<0.02	S	<0.02	ĉ	<0.02	La	40.02	Mo	<0.02	¥	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	2	40.02
œ	<0,02	ß	-1	Au	<0.02	3	<0.02	Nd	<0.02	ĸ	<0.2	8	<0.02	Ta	<0.02	Н	<0.02	2	40.02

(T) = Target analyte

Physical Characterization:

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

in politic

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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* All Standards should be stored with caps tight and under appropriate laboratory conditions.
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 * Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

urt # 58029 Lot # 102523

Part #											LEF	
58029	m/z->	1.0巨7	m/≥-> 2.0E7	2.567	m/z->- 5.0巨7	01 .0 .0 .0 .0 .0	1.0E6	Copper(II) nitrate trihydrate (Cu)	Volume sh	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number:	<u>CERTIFIED WEIGHT REPORT</u> Par Lo De	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Lot # 071723	0 0		110		10		[1] Spectrum No.		Volume shown below was diluted to (mL): Part Lot Number Number	Expiration Date: Recommended Storage: I Concentration (µg/mL): NIST Test Number:	<u>Part Number:</u> Lot Number: Description:	om
			0				, J	58129	Part Number	-		
	NNO		120		20		-	022723	d to (mL): Lot Number	071726 Ambient (20 °C) 1000 6UTB	58029 071723 Copper (Cu)	100
	230		130		а О		53.422 B	0.1000	2000.02 Dilution Factor	°,	(T	
			0		-		ac]:58	200.0	0.058 Initial Vol. (mL)	5E-05		
	840 040		4 0		\$		33.422 sec]:58029.D# [Count] [Linear]	0.084	Flask Uncertainty Uncertainty Pipette (mL) C	Balance Uncertainty		Certified R
1 of 2	N 5		1 0		n O		Count] [L	1000	Flask Uncertainty Uncertainty Nominal Pipette (mL) Conc. (µg/mL)	L.C. Z	Lot # 21110221	Reference M
	N 00		1.00		Ø		lnear]	10000.5	Initial Conc. (µg/mL)	(mL)	<u> </u>	laterial
	0						_	1000.0	Final) Conc. (µg/mL)			CRM M5751
			0		70			2.2	Expanded Uncertainty) +/- (µg/mL)	Reviewed By:		
Prin			0		g			10031-43-3	CAS			
Printed: 8/24/2023, 4:18:28 PM			190		0			3 1 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LDSO	Pedro L. Rentas		
023, 4:1			N		4			m3	SDS Information Safety Info. On Attac HA PEL (TWA)	Rentas		ANAI AR https://
8:28 PM			200		100			orf-rat 794 mg/kg	on ttached pg.) LDS0	071723	00743	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
								(g 3114	NIST	22	5	Accredited ate Number ndards.com

Printed: 8/24/2023, 4:18:28 PM	Printed: 8/24/20						2 of 2							1723	Lot # 071723	58029		Part #
			used in)). ST	rials are see above inty of NI 4).	nless oth w materia NIST (see Incertaint	t purity ra t purity ra ceable to sing the U gton, D.C	highesi highesi ndition: Expres Washin	and the and the with weigi ated. ated. g Office, g Office,	and ve assware vrated v wise st te labo r Evalua Printin	om gravimetric and volumetric measurements unless otherwise stated Class A glassware and the highest purity raw materials are use or to use. It are calibrated with weights traceable to NIST (see above). the, unless otherwise stated. Inder appropriate laboratory conditions. "Guidelines for Evaluating and Expressing the Uncertainty of NIST S. Government Printing Office, Washington, D.C. (1994).	l from g brated rrior to alue, u alue, u d under E., "Gu U.S. G	 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	onization culoush trically % of th 8.N. an hnical N	he concer sgohm dei standards, are meti s are meti d gravime (+/-) 0.5 (+/-) 0.5 (+/-) 0.5 Taylor, I NIST Tecl NIST Tecl	value is t 18.2 m 70 n f all m ontainen prepare certifed should b eference Result,"	The certified value is the concen Purified acids, 18.2 megohm deio the preparation of all standards. All standard containers are metic Standards are prepared gravimet Standards are certifed (+/-) 0.5 Standards should be stored w Uncertainty Reference: Taylor, E Measurement Result," NIST Tech	* * * * * * * * * * * * * * * * * * *	
d by:	Certified by:									is standard.	ion of th	Physical Characterization: Homogeneity: No heterogeneity was observed in the preparation of this standard.	served in	ion: eity was obs	acterizat heterogen	Physical Characterization: Homogeneity: No heterogeneity v	Phys i Homo	
						yte	get anal	(T) = Target analyte										
40.02 W <0.02 40.02 U <0.02	다. 같 답 답 답 답 답	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Ta S S Na A S S			40.02 40.02 40.02 40.02 40.02 40.02	K P P 2 S N N	40.02 40.02 40.02 40.02 40.02 40.02 40.02	Hg Nd	40.02 Li 40.02 Ni 40.02 Lu 40.02 Ni 40.02 Lu 40.02 Ni 40.02 Mg 40.02 No 40.02 Mg 40.01 Os 40.02 Mg 40.02 Pi 40.02 Hg 40.02 Pi 40.02 Hg 40.02 Pi 40.02 Nd 40.02 Pi 40.02 Nd 40.02 Pi 40.02 Nd 40.02 Pi	952F5	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	A C C C F F P	40.02 - 40.	5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Al Al Ba Be Bi	
						5	· .	ry (ICP-)	tromet	Mass Spec	asma l	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	lively (by Induct	nalysis	umental A	Instr	
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com					CRM	Certified Reference Material CRM	ence	ed Refer	Certifi					Inc.	Standards, Inc.	Absolute Standards, 800-368-1131 www.absolutestandards.com	Absolute : 800-368-1131 www.absolute	

Lot # 071723

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Certified Reference Material CRM



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							Trace M	letals	Verification	Ition	by ICP-MS		(ng/mL)							_
		and the second se	A CONTRACTOR OF A CONTRACTOR					All and	The share of	The second s	ALL DESCRIPTION OF THE OWNER OF T	Nonese and			and the second second second				A CONTRACTOR OF A CONTRACT	10
A	<0.02	3	<0.02	à	<0.02	Hf	<0.02	ГI	<0.02	N	<0.02	Ł	<0.02	Se	<0.2	Trb	<0.02	M	<0.02	-
Sb	<0.02	J	40.2	固	<0.02	Ho	≤0.02	2	<0.02	£	<0.02	Re	<0.02	S	<0.02	Ę	40.02	D	<0.02	_
As	<02	ඊ	<0.02	Eu	40.02	ч	40.02	Mg	10.0>	ő	<0.02	Rh	<0.02	Ag	<0.02	F	≤0.02	>	<0.02	-
Ba	<0.02	ű	<0.02	3	40.02	Ц	<0.02	Mn	<0.02	P	€0.02	£	<0.02	Ra	40 12	đ	<0.02	\$	<0.02	-
Be	T	Ċ	0.02	G	<0.02	e.	<02	Hg	<02	۵.	<0.02	Ru	≤0.02	2	<0.02	μ	<0.02	7	<0.02	-
Ä	<0.02	රී	<0.0≥	පී	<0.02	r.	<0.02	Mo	<0.02	đ,	0 .02	Sm	≤0.02	s	<0.02	Sn	<0.02	Za	<0.02	-
æ	<0.02	ð	<0.02	Au	<0.02	£	40.02	PN	<0.02	М	<0.2	ŝ	<0.02	Ta	<0.02	F	<0.02	2	40.02	_
									(T) = Tarr	get analy	yte									1

Physical Characterization:

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

Certified by:

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Part # 57050 Lot #	m/z->	N.01 M.4	m/2->-	1.0E5	177/2-> 2.0E5	N G M G	8. 0 11 15	1. Ammonium hexatluorostannate(IV) (Sn)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below w	<u>CERTIFIED WEIGHT REPORT</u> Part N Lot N Desc	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Lot # 071123	210		110 120		0 No		[1] Spectrum No.1	(W) (Sn) INO10 SND042023A1	Lot RM# Number	Expiration Date: 071126 Pecommended Storage: Ambient (20 °C) Concentration (µg/mL): 1000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	<u>PORT:</u> Part Number: <u>57050</u> Lot Number: <u>071123</u> Description: <u>Tin (Sn)</u>	s.com
	230		130		e e		[15.034 sec]:	1000	Nominal Conc. (µg/mL)	0 °C) 499.93	2	V
	20		140		ð		15.034 sec]:58150.D# [Count] [Linear]	99.999 0.10 44.2	Purity Uncertainty Assay (%) Purity (%) (%)	5E-05 Balance Uncertainty 0.058 Flask Uncertainty	Solvents:	Certifi
	N30 260		150 160		8		unt) [Linear]	1.13107	r Target Actual Weight (g) Weight (g)	(mL)	Lot # 21110221 22D0562008	Certified Reference Material
			170		70			1001.6	Actual Conc. (µg/mL)	ric acid	ric acid	CRM
			180		80			16919-	Expanded Uncertainty (Solv +/- (µg/mL) CAS#	Formulated By:		PPGP M
			190 200		90 100			7 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.))# OSHA PEL (TWA) LD50	Benson Chan		R
			0		ŏ			ω	on tached pg.) NIST LD50 SRM	071123 - 071123		ANAB ISC AR-1539 (https://Abso
												ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	•	Cei	Certified Reference Material CRM	ial CRM		ANAB ISO 17034 Accredited
www.absolutestandards.com	5				V	AR-1539 Certificate Number https://Absolutestandards.com
Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	ductively Coupled	Plasma Mass Spec	trometry (ICP-MS):			
		Trace Metals	Is Verification by ICP-MS	P-MS (µg/mL)		
AI <0.02 Cd <0.02	Dy <0.02	4003				
		2 2 2 2 2 2 2	<0.02 Ni 0.02 Nb		Se <0.2 Tb Si <0.02 Te	40.02 W 40.02
2 2 2 2 2 2 2 2			<0.01 Os <0.02 Pd	Rb Rb		\$ < c
	Ge 40.02	Fe 40.2 Hg	40.2 P 40.02 Pt	Ru Sm		_
			(T) = Target	4	ZITAS	<0.02 Zr <0.02
Physical Characterization:						Certified by:
Homogeneity: No heterogeneity was observed in the preparation of this standard.	observed in the prepa	ration of this standard.				//
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		9 4			20	
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Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
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Part # 57050 Lot # 071123

2 of 2

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redited Jumber ds.com	NIST SRM	3113		
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Formulated By: Lawrence Barry 091923 Formulated By: Lawrence Barry 091923 Reviewed By: Pedro L. Rentas 091923 Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.) N +/- (ug/mL) CAS# 0SHA PEL (TWA) LD50 S	ng/kg	180 B0 190 200 200 200	Printed: 2/8/2024, 5:01:14 PM
AM I'U (for (Nitric Acid	1000.0		
Certified Reference Material CRM 02109124	Solvent: Nttric Acid 40.0 (mL) httal bittal Conc. (ug/mL)	10000.0		
artified Réference l 0 Z 0 9 1 2 4	Lot # C 24002546 2.0% 2.0% Nominat Nominat Conc. (rg/mL)	1000	34.243 eec]:58027.D# [Count] [Linear] 30 40 50 130 140 150 230 240 250	1 of 2
Certified F		0.084	240 240 240	
Å	5E-05 0.058 on Initial or Vol. (mL)	00 200.0	3 eec]:55 230 30 23 130	
	57027 091923 Cobait (Co) 091926 Ambient (20 °C) 1000 6UTB 6UTB 6UTB d to (mL): 2000.02 Lot Dilution Lot Dilution	23 0.1000		
	57027 091923 Cobalt (Cobalt (Ambient Ambient 1000 6UTB ss diluted to (mL Part Lot	58127 050923		
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: Cobait (C Cobait (C 091926 Recommended Storage: Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): COTB NIST Test Number: COTB CODB	1. Cobatt(II) nitrate hexahydrate (Co) 58		<pre>Part # 57027 Lot # 091923</pre>

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Certified Reference Material CRM



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

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

L	200	10	2 Contraction	4	2000		400			-		4							
	20.05	3	20.05	5	20.02	Ħ	40.02	3	<0.02	ż	40.02	£	40.02	8	40.2	f	₫.02	M	40.02
_	40.02	లి	4 02	山	€0.02	Ho	40.02	5	<0.02	Ż	<u>40.02</u>	Re	<0.02	3	≤0.02	Le	€0.02	D	<0.02
_	402	ථ	€0.05	圕	40.02	Ч	40'02	Mg	10 ⁰ ⊳	ő	≤0.02	붭	<0.02	Ag	40.02	F	<0.02	Ż	<0.02
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_	10.05	ບັ	≤0.02	g	20.0 2	ङ	402	Hg	40.2	۵.	€0.02	Ru	<0.02	ي.	≪0.02	Ta	≤0.02	Y	€0.02
_	<0.02	ථ	£-	ö	40.02	Ľ	0 02	Mo	<u>60.02</u>	æ,	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	2	6 .02
_	40.02	ට්	<0.02	Au	40.02	£	40.02	PN	40.02	м	4 02	8	40.02	£	40.02	Ë	40.02	72	2002

Physical Characterization:

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

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Certified by:

Printed: 2/8/2024, 5:01:04 PM	1 of 2	Part # 57033 Lot # 111323
ő	230 240 250 26	m/z-> 210 220 2
		0 0 0
160 170 180 190 200	130 140 150 1	m/≥-> 110 120 1
		N m 4
80 70 80 100	90 40 50	5.0E4
		- 1 0 0 0 0
	34.433 sec]:57033.D# [Count] [Linear]	[1] Spectrum No.1 [34.433 2.0E5
1000.0 2.0 7440-38-2 0.5 mg/m3 orl-rat	400.0 0.084 1000	1. Arsenic (As) 58133 020522 0.1000
Expanded SDS Information Final Uncertainty (Solvent Safety Info. On Attached pg.) <u>nL) Conc. (ug/mL) +/- (ug/mL) CAS</u> # OSHA PEL (TWA) LD50	11	Part Lot Dilution Compound Number Number Factor
Reviewed By: Pedro L. Rentas 111323	0.06 Flask Uncertainty	Volume shown below was diluted to (mL): 4000.0
Hedre Fenter		
Id Acid Formulated By: Lawrence Barry 111992	24002546 Nitric Acid 2.0% 80.0	Description: <u>Arsenic (As)</u>
п (Lot # Solvent:	
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Certified Reference Material CRM	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com

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Certified Reference Material CRM



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

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

(T) = Target analyte

Physical Characterization:

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Low P. S.

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

Part # 57033 Lot # 111323

andrade.com In the property of the prope	m/z->	2500	m/z->	500	m/z->	י. ס ג ג ג ג	5.0E4	1. Ammonium dihydrogen phosphate (P)	Compound	Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	CERTIFIED WEIGHT REPORT: Par Lo	www.absolutestandards.com
R I R Z R Z M RZ R M Z R I WINC AND Lari Revenue V M Z R I WINC AND Revenue V M	210		110		0		[1] Spectrum		_	Description: Expiration Date: Recommended Storage: Concentration (µg/mL): NIST Test Number: Weight shown below was d	Part Number: Lot Number:	om
RICZINGLA MSRID	220		120		N O		-		Lot Number	Phosphore 041726 Ambient (20 10000 6UTB 6UTB	<u>57115</u> 041723	S.
Multical Actual Formulated By: Lawrence Barn Formulated By: Pedro L. Renta Reviewed By: Pedro L. Renta Actual Actual Uncertainty (Solvent Safety Info. 20.0 7722-76-1 5 mg/m3 5 mg/m3 160 170 180	230		130		۵		2.074 sec]:58			(P)		R
thic Acid Find Acid Formulated By: Lawrence Barn Reviewed By: Pedro L. Renta Lippanded Actual Actual Uncertainty (Solvent Safety Info. eight (g) Conc. (ug/mL) CAS# OSHA PEL (T) 2.7299 10000.0 20.0 7722-76-1 5 mg/m3 2.7299 10000.0 20.0 7722-76-1 5 mg/m3 2.7299 10000.0 1100 eio	240		140		4		1115.D# [Cou		Uncertainty Assay Purity (%) (%)	2% Balance Uncertainty Flask Uncertainty	Solvent:	2109/12
To so so to	250		150		U, O		ınt] [Linear]				Lot #	4 4
ht Formulated By: Lawrence Barn Neviewed By: Pedro L. Renta Expanded Uncertainty 	260							2.7289 10000	actual Actual Actual Actual	tric Acid	tric Acid	15815
the second secon					1			20.0		Formulated I	Q	
noe Barry 041723 L. Rentas 041723 So Information fety Info. On Attached pg.) A PEL (TWA) LDSO 5 mg/m3 orl-rat >2000mg/kg 5 o 200			4						SI (Solvent Sa CAS# OSH	Y: Law	derme !	5
o o o o o o o o o o o o o o o o									DS Information Ifety Info. On Atta IA PEL (TWA)	I. Rentas	pr 1	https://A
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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com			Certified Reference Material CRM	ence Material (CRM			×	ANA AR- https:/	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
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Sodium Chloride, Crystal BAKER ANALYZED® A.C.S. Reagent





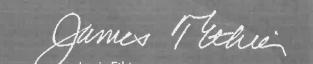


Material No.: 3624-01 Batch No.: 0000281938 Manufactured Date: 2021-06-07 Retest Date: 2026-06-07 Revision No.: 1

Certificate of Analysis

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



Jamie Ethier Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Mansford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone 610.386.1700



Certificate of Analysis

R: 02/22/24 M.5942

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution					
Catalog Number:	CGTI1					
Lot Number:	T2-TI719972					
Matrix:	2% (v/v) HNO3 tr. HF					
Value / Analyte(s):	1 000 μg/mL ea: Titanium					
Starting Material:	Ti Metal					
Starting Material Lot#:	2094					
Starting Material Purity:	99.9975%					
CERTIFIED VALUES AND UNCERTAINTIES						

Certified Value:	1002 ± 5 μg/mL
Density:	1.012 g/mL (measured at 20 ± 4 °C)

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Assay Information:

3.0

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

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

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

Characterization of CRM/RM by Two or More Methods	Characterization of CRM/RM by One Method
Certified Value, $X_{\mbox{CRM/RM}}$, where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X _{CRMRM} , where one method of characterization is used is the mean of individual results:
$\begin{split} & \textbf{X}_{CRM/RM} = \Sigma(w_i) \; (\textbf{X}_i) \\ & \textbf{X}_i = \text{mean of Assay Method } i \; \text{with standard uncertainty } \textbf{u}_{char \; i} \\ & \textbf{w}_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & \textbf{w}_i = (1/u_{char \; i})^2 / (\Sigma(1/(u_{char \; i})^2)) \end{split}$	$X_{CRM/RM} = (X_a) (u_{char a})$ $X_a = mean of Assay Method A withu_{char a} = the standard uncertainty of characterization Method A$
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts}$) ^{Y₂} k = coverage factor = 2 $u_{char} = [\Sigma((w_i)^2 (u_{char}_i)^2)]^{Y_2}$ where u_{char} is the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty u_{tts} = long term stability standard uncertainty (storage) u_{tts} = transport slability standard uncertainty	CRMRM Expanded Uncertainty (±) = U _{CRMRM} = k ($u^2_{char e} + u^2_{bb} + u^2_{lts} + u^2_{ts}$) ^{1/2} k = coverage factor = 2 uchar e = the errors from characterization u _{bb} = bottle to bottle homogeneity standard uncertainty u _{lts} = long term stability standard uncertainty (storage) u _{ts} = transport stability standard uncertainty

Page 1 of 4

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

М	Ag	<	0.000536	Μ	Eu	<	0.000268	0	Na	<	0.032670	Μ	Se		0.001204	0	Zn	<	0.003267	
0	AI		0.000872	0	Fe		0.003225	0	Nb	<	0.043560	0	Si		0.004735	0	Zr	<	0.043560	ŧ
М	As	<	0.008586	М	Ga	<	0.000268	Μ	Nd	<	0.000268	Μ	Sm	<	0.000268					
Μ	Au	<	0.004577	Μ	Gd	<	0.000268	0	Ni	<	0.010890	М	Sn		0.000096					
0	В	<	0.008929	М	Ge	<	0.002146	M	Os	<	0.000269	0	Sr		0.000096					
М	Ba	<	0.002683	Μ	Hf		0.002161	0	P	<	0.054450	М	Та		0.010560					
M	Be	<	0.005366	Μ	Hg	<	0.003231	Μ	Pb	<	0.001073	Μ	Тb	<	0.000268					
М	Bi	<	0.001609	М	Но	<	0.000268	М	Pd	<	0.000268	Μ	Те	<	0.001341					
0	Ca		0.000676	Μ	In	<	0.002683	Μ	Pr	<	0.000268	Μ	Th	<	0.053663					
М	Cd	<	0.000268	Μ	lr –	<	0.000269	М	Pt	<	0.000536	S	Tī	<						
М	Се	<	0.000268	Μ	κ		0.001172	М	Rb	<	0.000268	Μ	TI	<	0.000268					
М	Co	<	0.004293	Μ	La	<	0.000268	М	Re	<	0.000268	Μ	Tm	<	0.000268					
М	Cr		0.000752	0	Li	<	0.027225	M	Rh	<	0.000268	M	U	<	0.000268					
М	Cs	<	0.000268	М	Lu	<	0.000268	Μ	Ru	<	0.000269	M	V	<	0.019855					
0	Cu	<	0.010890	0	Mg	<	0.005445	i	S	<		Μ	W		0.000473					
M	Dy	<	0.000268	0	Mn	<	0.003267	M	Sb	<	0.006976	Μ	Y	<	0.002146					
Μ	Er	<	0.000268	Μ	Мо		0.000774	0	Sc	<	0.004900	М	Yb	<	0.000536					

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 17, 2022

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

11.2 Lot Expiration Date

- June 17, 2027
- The date after which this CRM/RM should not be used.

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

11.3 Period of Validity

- Sealed TCT Bag Open Date: _

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

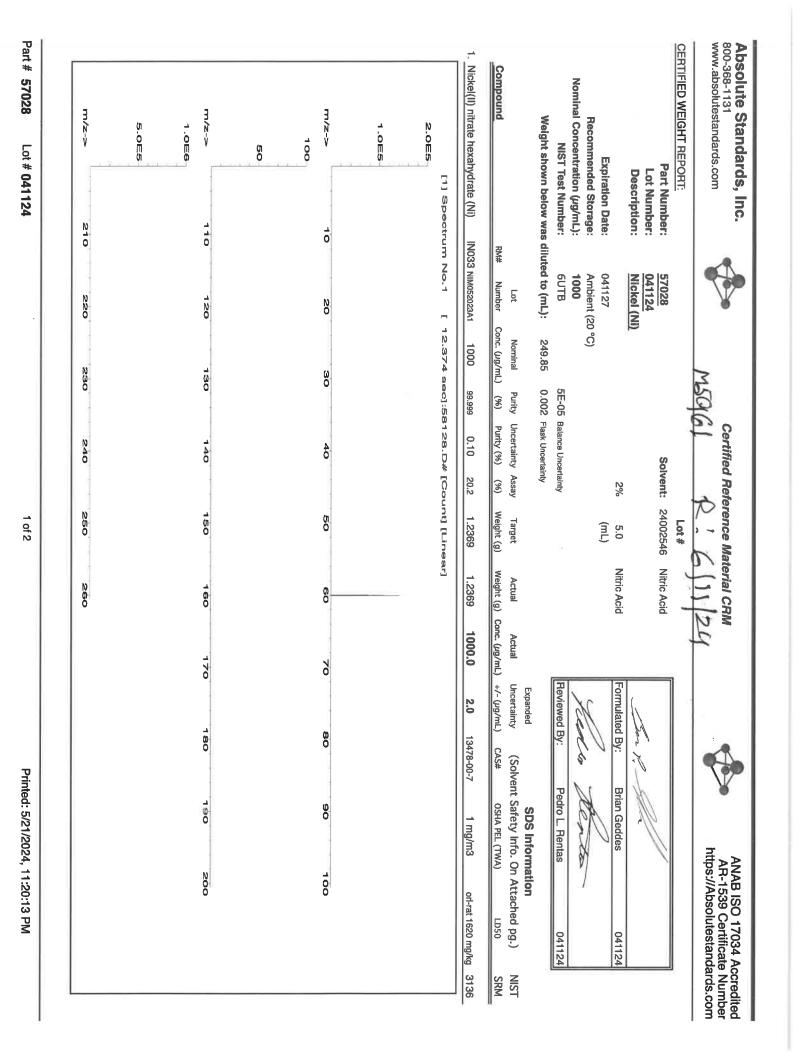
Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

DD978ti

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



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300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 **ACCREDITATION / REGISTRATION**

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



2.0 **PRODUCT DESCRIPTION**

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Assav Information:

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

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 17, 2022

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

11.2 Lot Expiration Date

- July 17, 2027

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

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

Uyen Truong Supervisor, Product Documentation

Michael 2 Booth

Certificate Approved By:

Michael Booth **Director**, Technical

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine

ADSOIUTE STANDARDS, INC. 800-368-1131 www absolutestandards com	P			0	ertified R	eference	Material CF				AR	ANAB ISO 17034 Accredited AR-1539 Certificate Number	ocredited Number
			X	6	-	ž	K5981 R:61	1	124	6	https	https://Absolutestandards.com	ards.com
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number: Lot Number:		57092 060724				24002546	Nitric Acid		Phina R	1° man Mr. 9	ARector		
Description:		Uranium (U)	ົ						252				
						2.0%	40.0	Nitric Acid	Formulated By:	2	Giovanni Esposito	060724	
Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):		060727 Ambient (20 °C) 1000	0 °C)				(mL)		Jus	42 . A	enter		
NIST Test Number:		GUTB		5E-05	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	060724	
Volume shown below was diluted to (mL):	was dilute	d to (mL):	2000.07	0.100	Flask Uncertainty								-
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Expanded Uncertainty	(Solven	SDS Information (Solvent Safety Info. On Attached pg.)	tion Attached po.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Vol. (mL) Pipette (mL) (Conc. (µg/mL)	Conc. (ug/mL)	Conc. (µg/mL)	+/- (ug/ml.)	CAS#	OSHA PEL (TWA)	LD50	SRM
1. Uranyl nitrate hexahydrate (U)	58192	041524	0.1000	200.0	0.084	1000	10001.5	1000.0	2.2	13520-83-7	0.05 mg/m3	orl-rat 1040 mg/kg	3164
[1] Spectrum No.1	trum No	а <u>н</u>	23.254 sec]:57092.D# [Count] [Linear]	9c]:570	092.D#[0	ini) [Ini	near]						F
1.0E6) 1							
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	10	0	30		40	50	00	20		80	08	100	_
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m/z->	0	120	130	0	440	150	160	021		081	Cer	000	
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Part # 57092 Lot # 060724						1 of 2				Printe	Printed: 6/7/2024, 3:58:45 PM	8:45 PM	

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





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



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Physical Characterization:

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

Certified by:

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

For Trace Metal Analysis

Low Selenium

W form - Np





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 (NH4)	≤ 1 ppm	1 ppm
Chloride (Cl)	≤ 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



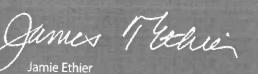


Material No.: 9673-33 Batch No.: 23D2462010

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



C10 30C 1300

Jamie Ethier Vice President Global Quality

1.0



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

1.025 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods	Characterization of CRM/RM by One Method
Certified Value, X _{CRWRM} , where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X _{CRWRM} , where one method of characterization is used is the mean of individual results:
$\mathbf{x}_{\mathbf{CRM/RM}} = \Sigma(\mathbf{w}_i) (\mathbf{x}_i)$	$X_{CRM/RM} = (X_{a}) (u_{char a})$
X _i = mean of Assay Method I with standard uncertainty u _{char i}	X _a = mean of Assay Method A with
w_j = the weighting factors for each method calculated using the inverse square of the variance: $w_i = (1/u_{char})^2 / (\Sigma(1/(u_{char})^2))$	$\boldsymbol{u}_{char,a}$ = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$	CRM/RM Expanded Uncertainty (1) = U _{CRM/RM} = k (u ² _{char a} + u ² _{bb} + u ² _{fts} + u ² _{ts}) [%]
k = coverage factor = 2	k = coverage factor = 2
$u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{\frac{1}{2}}$ where u_{char} are the errors from each characterization method	uchar a = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	ubb = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
uts = transport stability standard uncertainty	uts = transport stability standard uncertainty
Certified Abundance:	
IV's Certified Abundance	

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

11.1 Certification Issue Date

June 21, 2023

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

11.2 Lot Expiration Date

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

SD9781. Paul R Saine

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Part # 57040 Lot # 071423	m/≚-≫ 210 220	5.0E7	m/z-≫ 110 120 1.0E8	^{5.} 0∈7	m/≂-≫ 10 20 1.0E8	ប. ញ	[1] Spectrum No.1 1.0E6	1. Zirconyl chloride octahydrate (Zr) 58140 070621	Part Lot Compound Number Number	800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT: Part Number: 57040 Lot Number: 071423 Description: Zirconium (Zr Sinconium (Zr Concentration (µg/mL): 000 NIST Test Number: 6UTB Volume shown below was diluted to (mL): 2
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	N 00 O		160		0		8]	10000.3 1000.0	Initial Final Conc. (µg/mL) Conc. (µg/mL)	A CRM Solvent: Nitric Acid 40.0 Nitric Acid (mL)
			170		70			0 2.2	Expanded Uncertainty 'mL) +/- (µg/mL)	d 24 Formulated By: Reviewed By:
Printed:			180 1		0 O			13520-92-8	(Solvent : CAS# OS	
Printed: 9/27/2024, 10:15:02 AM			190 200		9 C 100			NA	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50	AR-15 AR-15 https://Al Benson Chan Pedro L. Rentas
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								NA	SRM	rds.com

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



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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(1) = larget analyte

Physical Characterization:

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

Certified by:

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* 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 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).

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number:	Setting Certified Reference Material CRM Setting National 112124 N.S. I/I/3/250/vent: 24012496 Magnesium (Mg) N.S. I/I/3/250/vent: 24012496 Nitric Acid 112127 N.G. V.Y. 2% 40.0 Nitric Acid 112127 M.G.V.Y. 2% 40.0 Nitric Acid 112127 M.G.V.Y. 2% 40.0 Nitric Acid 110000 GUTB 5E-05 Balance Uncertainty 5E-05	Formulated By:
Weight shown below was diluted to (mL):	2000.07 0.100 Fask Uncertainty 2000.07 0.100 Fask Uncertainty Nominal Purthy Uncertainty Assay Target Actual Conc. (ug/mL) (%) Purthy (%) (%) Weight (g)	Expanded SDS Information Actual Uncertainty Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (ug/mL) +/- (ug/mL) CAS# OSHA PEL (TWA)
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m/z-≫ 210	220 230 240 250 260	

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



Certified Reference Material CRM



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

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

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(I) = larget analyte

Physical Characterization:

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

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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.

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

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

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

Part # 58112 Lot # 112124

Dat # 60036 101 #	m/z->-	5.067	m/z-> 1.0⋿8	5.067	m/≥-> 1.0E8	N.5 8	5.006	1. Manganese(II) nitrate hydrate (Mn)	Weight sh Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number:	CERTIFIED WEIGHT REPORT: Part I Lot Des	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Lot # 101124	Ņ		110		10		[1] Spectrum No.1		Weight shown below was diluted to (mL): Lot RM# Number	Expiration Date: Recommended Storage: Il Concentration (µg/mL): NIST Test Number:	<u>Part Number:</u> Lot Number: Description:	s, Inc.
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Prin			180		8			2.0 15710-66-4	Expanded Uncertainty (SolVe +/- (µg/mL) CAS#	Pormulated by:	Giovannie	
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www.absolutestandards.com	800-368-1131	Absolute Standards,
		Inc.





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

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

(T) = Target analyte

Physical Characterization:

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

for P. S.

Certified by:

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

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

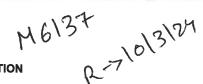
* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Part # 58025 Lot # 101124



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA 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).

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



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%
CERTIFIED VALUES AN	D UNCERTAINTIES
Certified Value:	999 ± 6 µg/mL
Density:	1.003 g/mL (measured at 20 \pm 4 °C)

Assay Information:

3.0

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

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

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

 $X_i = mean of Assay Method i with standard uncertainty <math>v_{char} i$ $w_i = the weighting factors for each method calculated using the inverse square of$ the variance:

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

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²_{char} + u²_{bb} + u²₁₅ + u²_{ts})^{1/2} k = coverage factor = 2 u_{char} = [2((w_i)² (u_{char})²)]^{1/2} where u_{char} is the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty

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

Characterization of CRM/RM by One Method Certified Value, X_{CRMRM}, where one method of characterization

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

 $\begin{array}{l} X_{CRM/RM} = (X_{a}) \, (u_{char\ a}) \\ X_{a} = mean\ of Assay\ Method\ A\ with \\ u_{char\ a} = the\ standard\ uncertainty\ of\ characterization\ Method\ A \end{array}$

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

M	Ag	<	0.000310	М	Eu	<	0.000310	0	Na		0.001656	М	Se	<	0.022000	М	Zn	<	0.002500
М	Al		0.010787	М	Fe	<	0.027000	М	Nb	<	0.001300	s	Si	<		0	Zr	<	0.001900
М	As	<	0.001900	М	Ga	<	0.001300	М	Nd	<	0.000310	м	Sm	<	0.000310				
M	Au	<	0.000910	М	Gd	<	0.000310	Μ	Ni	<	0.005500	м	Sn		0.000096				
M	в		0.016180	М	Ge	<	0.001900	М	Os	<	0.000610	0	Sr		0.000092				
Μ	Ba		0.000096	М	Hf		0.000423	i	Р	<		M	Та		0.002542				
0	Be	<	0.000570	М	Hg	<	0.000610	М	Pb	<	0.000310			<	0.000310				
М	Bi	<	0.000310	М	Но	<	0.000610	м	Pd	<	0.000610		_	<	0.000910				
0	Са		0.011557	М	in	<	0.000310	М	Pr	<	0.000310			<	0.001900				
М	Cď	<	0.000310	M	lr	<	0.000310	м		<	0.000310		П		0.001078				
М	Се	<	0.000610	0	ĸ		0.000577		Rb		0.009100			<	0.000310				
М	Co	<	0.001600	M	La	<	0.000310		Re		0.000310		Tm						
М	Cr	<	0.010000		Li	<	0.000460		Rh						0.000310				
				-							0.000310	IVI	U	<	0.000310				
M	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	Dy	<	0.000310	М	Mn	<	0.002500	М	Sb	<	0.000310	М	Y	<	0.000310				
М	Er	<	0.000310	М	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>, <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain Information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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 except HF.

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.

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

QUALITY STANDARD DOCUMENTATION 10.0

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 10, 2024

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

11.2 Lot Expiration Date

- July 10, 2029

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

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

11.3 Period of Validity

Sealed TCT Bag Open Date:

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

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

Uyen Truong Custom Processing Supervisor

Aleya Mung Monggini Kh Paul R Laina

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Page 4 of 4

m/z->	\$ 000	m/z-≻ 1.0E4	-1 .0 M 03	m/z-> 2.0E5	1.0E8	2.000	1. Potassium nitrate (K)	Compound	NIST Te Weight show	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	<u>CERTIFIED WEIGHT REPORT:</u> Part Lot De	800-368-1131 www.absolutestandards.com
N 0		110		1 0		[1] Spectrum No.1	IN034	RM#	NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Expiration Date: nended Storage: ntration (µg/mL):	ORT: Part Number: Lot Number: Description:	3 3
		120		20		-	IN034 KD062022A1	Lat		103027 Ambient (20 °C) 10000	<u>57119</u> <u>103024</u> Potassium (†	
		1 0 0		a		35.763 sec]:58119.D# [Count] [Linear]	10000 99.999	Nominal Purity Conc. (µg/mL) (%)	5E-05 4000.1 0.15	M6143	$\frac{57119}{103024} R \rightarrow 1/13/2.5$ $\frac{103024}{1043} M 61/11$	
		1. 0		40		8119.D# [C	0.10 37.7	Uncertainty Assay Purity (%) (%)	5E-05 Balance Uncertainty 0.15 Flask Uncertainty		Solvent:	Certified Re
		150		07. O		ount] [Lines	106.1040	y Target Weight (g)			Lot # t: 24002546	Certified Reference Material CRM
		10- 0		0		'n	##### 100	Actual Act Weight (g) Conc.			Nitric Acid	erial CRM
		170		0			10001.1 20.0	Expanded Actual Uncertainty Conc. (µg/mL) +/- (µg/mL)	Reviewed By:	X	Hierat	
		180		80			7757-79-1	CAS#		\$	Vie.	
		061		80			5 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA)	Pedro L. Rentas	tento	Capestite Giovanni Esposito	http
		200		100			orl-rat 3750 mg/kg 3141a	n Attached pg.) A) LD50	103024		103024	AIVAD ISO 17034 Accreated AR-1539 Certificate Number https://Absolutestandards.com
							vkg 3141a	NIST	124		24	4 Accredit ate Numb ndards.cc

Part # 57119 Lot # 103024

1 of 2

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



Certified Reference Material CRM



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

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

							Trace Me	etals	Verifica	tion	by ICP-	MS (/ug/mL)						
A	<0.02	Cd	<0.02	D,	<0.02	Hf	<0.02	5	<0.02	Ni	<0.02	77	<0.02	Se	A0.2	Тb	40.02	W	40.02
SP	<0.02	្ឋ	40.2	막	<0.02	Но	<0.02	Lu	<0.02	ĥ	<0.02	Re	<0.02	ŝ	<0.02	Te	<0.02	e	<0.02
As	<0.2	ĉ	<0.02	E	<0.02	In	<0.02	Mg	<0.01	^S	<0.02	Rh	<0.02	Ag	<0.02	Ξ	<0.02	<	<0.02
Ba	<0.02	ŝ	<0.02	ଜୁ	<0.02	ŀ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	40.2	ТЪ	40.02	Ϋ́b	<0.02
Be	<0.01	ç	<0.02	Ga	<0.02	Fe	<02	Hg	40.2	P	<0.02	Ru	<0.02	ST	<0.02	Im	<0.02	Y	<0.02
Bi	<0.02	S	<0.02	ନ୍ନ	<0.02	2	<0.02	Mo	<0.02	7	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	<0.02
B	<0.02	0°	<0.02	Au	<0.02	РЪ	<0.02	Nd	<0.02	K	T	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02
									3										

(I) = Target analyte

Physical Characterization:

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

In & All

Certified by:

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

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

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

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

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

Part # 57119 Lot # 103024

Part # 58111 Lot # 072424	m/z->	თ მ	m/z->	א. ה ס		N 51 11 63	5.0E5	1. Sodium nitrate (Na)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Welght shown below wa	CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
424	210 220		110 120		ว ง ง		[1] Spectrum No.1	IN036 NAV01201511 1	RM# Lot N	072427 Ambient (20 ° 10000 6UTB s diluted to (mL):	N <u>RT:</u> nber: <u>58111</u> nber: <u>072424</u> tion: <u>Sodium (Na)</u>	Inc.
	230		130 140		30 40		8.935 sec]:58111.D# [Count] [Linear]	10000 99.999 0.10 26.9	Nominal Purity Uncertainty Assay Conc. (ug/mL) (%) Purity (%) (%)	C) 5E-05 Balance Uncertainty 4000.2 0.10 Flask Uncertainty	Solv	Certified Re
1 of 2	250 260		150 160 1		50 60		unt] [Linear]	148.7096 ###### 10000.0	Target Actual Actual Weight (g) Weight (g) Conc. (µg/mL)	80.0 Nitric Acid (mL)	Lot # 24002546 Nitric Acid	Certified Reference Material CRM
Printed: 1/10/2025, 4:48:22 PM			170 180 190 200		70 80 90 100			20.0 7631-99-4 5 mg/m3 orl	Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.)) +/- (µg/mL) CAS# OSHA PEL (TWA) LDSO	ad By: By: Ped		ANAB I AR-15: https://Ab
22 PM								orl-rat 3430 mg/kg 3152a	LDS0 SRM	072424 072424		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

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



Certified Reference Material CRM



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

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

	<0.02 Cu <0.02	<0.02 Co <0.02	Be <0.01 Cr <0.02 Ga	<0.02 Cs <0.02	<0.2 Cc <0.02	<0.02 Ca <0.2	<0.02 Cd <0.02	THE PARTY OF ALL AND ADDRESS OF ALL ADDRESS OF ALL ADDRESS OF ADDRESS OF ADDRESS OF ADDRESS OF ADDR		
	<0.02	<0.02	<0.02	<0.02	<0.02	40.02	<0.02	N No. of Lot 1941		
	Pb	La	Fe	F	In	Ho	Hf			
	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	Notice Inc.	Irace Me	
	Nd	Mo	Hg	Mn	Mg	L	C		letals	
(T) = Tarc	<0.02	40.02	<0.2	<0.02	<0.01	<0.02	<0.02	A STATE OF	Verifica	
Taroet analyte	K	7	ъ	Pd	0s	Nb	N		TION	
vte	-0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		OY ILP-N	57
	Sc	Sm	Ru	Rb	Rh	Re	Pr	ALL STATES		5
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	g/mL)	
	Ta	ŝ	Sr	Na	Ag	<u>8</u>	%			
	<0.02	<0.02	<0.02	Т	<0.02	<0.02	<0.2			
	T	Sn	Tm	Th	H	Te	Tb			
	<0,02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	The second se		
	Zr	Zn	Y	Yb	<	Ч	W			
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			

Physical Characterization:

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

In P. St.

Certified by:

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

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

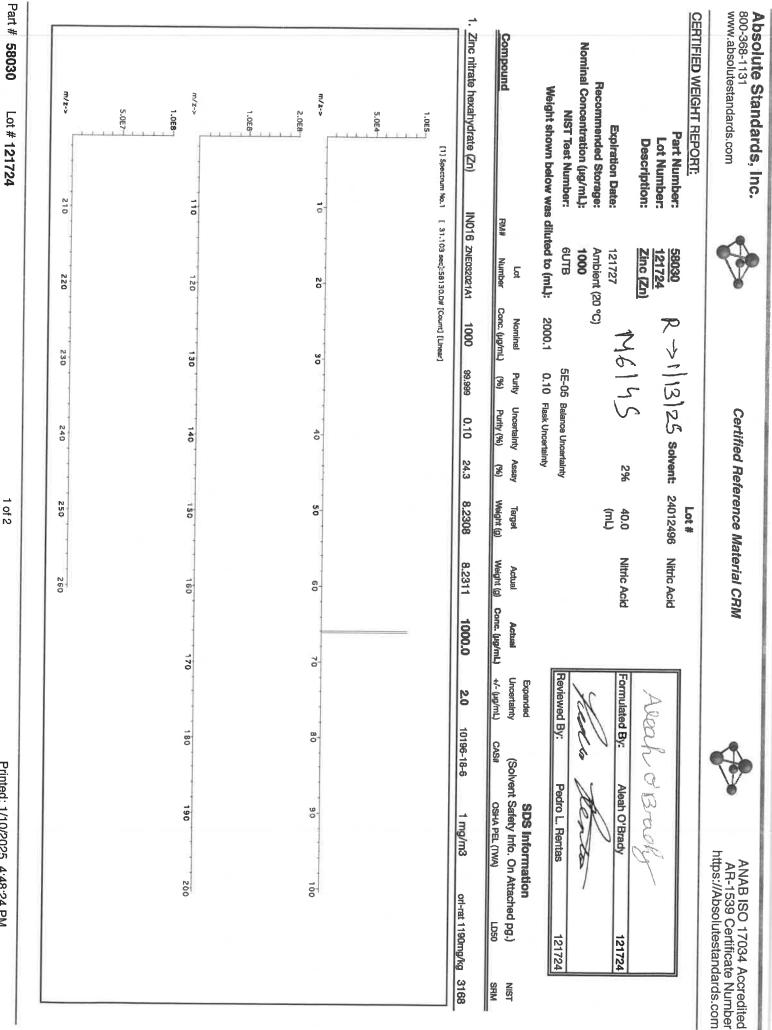
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All standard containers are meticulously cleaned prior to use.

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).



1 of 2

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





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

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

							I race M	etais	Verifica		by icr-	UNIC	/9/111L/	L					
															2	77	50.02	W	SUG
A1	cu u-	1 64 1	20.02	Dv	<0.02	Hf	<0.02	Li	40.02	Z	40.02	P	<0.02	Se	202	10	20.02	W	20.02
2	10.01	1		1	5	;	3	;	2	Ş	2002	R P	<0.02	2	<0.02	Fe	<0.02	C	<0.02
S	20.02	C ₂	2.2	CT.	20.02	0 M	10.02	5	1024		10.01	1			2	1	50.00	4	33
Å	502	ç	<0.02	Fu	<0.02	h	<0.02	Mg	A0.01	õ	<0.02	Kh	20.02	Ag	20.02	11	70.02		-0.01
1			5	2	5	7	333	Š	50.02	Р	40.02	Rb	A0.02	Na	4012	Th	<0.02	ХP	20.02
Ba	20.05	Ç	20.02	00	10.04	**						,	5	?	500	1	33	<	30
Re	-001	R	<0.02	ନ୍ମ	<0.02	Fe	<0.2	Hg	40.2	7	<0.02	KU	<0.02	2	20.02	L III	10.01	3,	3
2	2	2	3	2	2000	5	300	K	<0.02	Ş	A.02	Sm	A.02	S	<0.02	Sn	<0.02	20	F
10	20.02	ξ	10.02	00	10.00						5	2	5	7	33	1	<0 03	77	<0.02
80	<0.02	Q	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	К	202	30	20.02	1a	20.02		10.04		

(T) = Target analyte

Physical Characterization:

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

Ser R. She

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Part # 58030 Lot # 121724



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

16150

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

- APPLICATION: For use with the CLP SFAM01.0 SOW and revisions.
 - **<u>CAUTION</u>**: Read instructions carefully before opening bottle(s) and proceeding with the analyses.

Contains Metals In Dilute Acidic or Cyanide in Basic Aqueous Solutions HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

ICV1-1014 For ICP-AES analysis, use a 10-fold dilution by pipetting 10 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.

RMs ICV 1, 5, 6 SFAM.docx

Page 1 of 2

QATS Form 20-007F188R00, 04-19-2021



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



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

APTIM	Instructions for QATS Reference Material: Inorganic ICV Solutions
ICV1-1014	For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.
ICV5-0415	For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K ₂ Cr ₂ O ₇ and 5% (v/v) nitric acid.
ICV6-0400	For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

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

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	D. L.
ACS - Assay (as HCI) (by acid-base titrn)		Result
ACS - Color (APHA)	36.5 - 38.0 %	37.9 %
ACS - Residue after Ignition	≤ 10	5
ACS - Specific Gravity at 60°/60°F	≤ 3 ppm	< 1 ppm
ACS – Bromide (Br)	1.185 - 1.192	1.191
ACS - Extractable Organic Substances	≤ 0.005 %	< 0.005 %
ACS – Free Chlorine (as Cl ₂)	≤ 5 ppm	< 1 ppm
Phosphate (PO4)	≤ 0.5 ppm	< 0.5 ppm
Sulfate (SO4)	≤ 0.05 ppm	< 0.03 ppm
Sulfite (SO3)	≤ 0.5 ppm	< 0.3 ppm
Ammonium (NH4)	≤ 0.8 ppm	0.3 ppm
Trace Impurities - Arsenic (As)	≤ 3 ppm	< 1 ppm
Trace Impurities - Aluminum (Al)	≤ 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
	≤ 1.0 ppb	0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1 .0 ppb	< 0.2 ppb
Trace Impurities - Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities - Calcium (Ca)	≤ 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
Trace Impurities - Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	≤ 4.0 ppb	0.6 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	6 ppb

>>> Continued on page 2 >>>

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





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

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

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



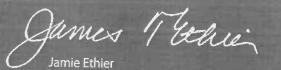


Material No.: 9530-33 Batch No.: 22G2862015

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



Vice President Global Quality



Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

3.0

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).

R->1/7/25

M6153

F: 540-585-3012 info@inorganicventures.com

P: 800-669-6799/540-585-3030



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%
CERTIFIED VALUES AN	ID UNCERTAINTIES
Certified Value:	10081 ± 39 μg/mL
Density:	1.030 g/mL (measured at 20 \pm 4 °C)
Assay Information:	

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:

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

X_i = mean of Assay Method i with standard uncertainty u_{char} i w_i ≃ the weighting factors for each method calculated using the inverse square of the variance:

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

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

k = coverage factor = 2

$$\begin{split} u_{char} &= [\widehat{\Sigma}] (w_{f})^2 \left(u_{char} \right)^2)]^{5/2} \ \text{where} \ u_{char} \ i \ \text{are} \ \text{the errors from each characterization method} \\ u_{bb} &= \ \text{bottle to bottle homogeneity standard uncertainty} \\ u_{fts} &= \ \text{long term stability standard uncertainty (storage)} \end{split}$$

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method Certified Value, X_{CRM/RM}, where one method of characterization

- is used is the mean of individual results: X_{CRM/RM} = (X_a) (u_{char a})
 - Image: Contain and Contain and Containing and Cont

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k ($u^2_{char a} + u^2_{bb} + u^2_{HS} + u^2_{TS}$)^½ k = coverage factor = 2 $u_{char a}$ = the errors from characterization

$$\begin{split} u_{bb} &= \text{bottle to bottle homogeneity standard uncertainty} \\ u_{tts} &= \text{long term stability standard uncertainty (storage)} \\ u_{tts} &= \text{transport stability standard uncertainty} \end{split}$$

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

Μ	Ag	<	0.000960	М	Eu	<	0.000480	0	Na		0.002964	М	Se	<	0.042000	М	Zn	0.004560
М	AI		0.003420	0	Fe		0.013225	М	Nb	<	0.000480	0	Si		0.012997	М	Zr	0.001847
М	As	<	0.007200	M	Ga	<	0.002900	М	Nd	<	0.000480	М	Sm	<	0.000480			
М	Au	<	0.003900	М	Gd	<	0.000480	0	Ni		0.001482	М	Sn	<	0.000480			
ο	в	<	0.003200	М	Ge	<	0.004800	М	Os	<	0.001500	s	Sr	<				
М	Ва		0.638494	м	Hf	<	0.000480	0	Р	<	0.017000	М	Та	<	0.000480			
ο	Be	<	0.000450	м	Hg	<	0.000960	М	Pb		0.010717	М	ть	<	0.000480			
М	Bi	<	0.002000	М	Ho	<	0.000480	М	Pd	<	0.002000	м	Те	<	0.016000			
0	Ca		0.025083	м	In	<	0.008600	М	Pr		0.000547	м	Th	<	0.000480			
М	Cd	<	0.000960	м	lr	<	0.000480	м	Pt	<	0.000480	М	Ті		0.004560			
M	Ce		0.000661	0	ĸ		0.025083	M	Rb	<	0.003400	M	ТІ	<	0.000480			
M	Co		0.001527	м	La	<	0.000480		Re	<	0.000480		Tm		0.004332			
0	Cr	<	0.004700		Li	<	0.005600		Rh	<	0.013000		U	<	0.000480			
M		<	0.000480	-			0.000480		Ru		0.000960		v					
					Lu	<	+			<			•	<	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	о	Y	<	0.001200			
м	Er	<	0.000480	М	Мо	<	0.002900	М	Sc	<	0.001500	М	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>. <u>https://www.inorganicventures.com/terms-and-conditions-sale</u>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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 <u>radial/axial</u> view):

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 11.0

11.1 Certification Issue Date

August 26, 2024

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

11.2 Lot Expiration Date

- August 26, 2029

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

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

Uyen Truong Custom Processing Supervisor

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Mayn Mun Mayni M Paul R Laina

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Nitric Acid 69% CMOS





R-0210212025

M-6158

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

Certificate of Analysis

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

>>> Continued on page 2 >>>

Wavantor^{**}



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

Test	Specification	Result
Trace Impurities – Niobium (Nb)	≤ 50.0 ppb	
Trace Impurities – Potassium (K)		< 1.0 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	16 ppb
Trace Impurities - Silver (Ag)	≤ 50 ppb	< 10 ppb
•	≤ 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)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Thallium (TI)		< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Titanium (Ti)	≤ 20.0 ppb	< 10.0 ppb
	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 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		< 1.0 ppb
Particle Count - 1.0 µm and greater	≤ 60 par/mi	10 par/ml
and greater	≤ 10 par/mi	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

Junie Croak Director Quality Operations, Bioscience Production

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

VENTURES

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

M5743

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

1.0 **ACCREDITATION / REGISTRATION**

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

A: 4/11/22



2.0 **PRODUCT DESCRIPTION**

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

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

Density:

1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

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

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

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

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te	m					Δt.

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

4.0 **TRACEABILITY TO NIST**

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 03, 2021

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

11.2 Lot Expiration Date

- September 03, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Bath

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine

RD: 07/14/2022



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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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



Page 1 of 2



ICSB: M5874

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

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

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

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

	Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-MS ICSA-0803, AND ICSA-0803 MIXED WITH ICSB-0803									
Element	CRQL	Part A (µg/L)	Part A Limit Limit +Par		Part A +Part B (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)			
AI	20.0	[100000]			[100000]					
Sb	2.0	(1.5)	-2.5	5.5	(22.0)	18.0	26.0			
As	1.0	(0.1)	-1.9	2.1	19.0	16.2	21.9			
Ba	10.0	(1.2)	-18.8	21.2	(22.0)	2.0	42.0			
Be	1.0	(0)	-2.0	2.0	19.0	16.2	21.9			
Cd	1.0	(0.7)	-1.3	2.7	20.0	17.0	23.0			
Ca	500	[100000]			[100000]					
С		[200000]			[200000]					
CI		[1000000]			[1000000]					
Cr	2.0	(21.0)	17.0	25.0	40.0	34.0	46.0			
Co	1.0	(1.0)	-1.0	3.0	20.0	17.0	23.0			
Cu	2.0	(8.0)	4.0	12.0	(25.0)	21.0	29.0			
Fe	200	[100000]			[100000]					
Pb	1.0	(4.0)	2.0	6.0	25.0	21.3	28.8			
Mg	500	[100000]			[100000]					
Mn	1.0	(7.0)	5.0	9.0	27.0	23.0	31.1			
Мо		[2000]			[2000]					
Ni	1.0	(6.0)	4.0	8.0	24.0	20.4	27.6			
Р		[100000]			[100000]					
K	500	[100000]			[100000]					
Se	5.0	(0.3)	-9.7	10.3	(19.0)	9.0	29.0			
Ag	1.0	(0)	-2.0	2.0	18.0	15.3	20.7			
Na	500	[100000]			[100000]					
S		[100000]			[100000]					
TI	1.0	(0)	-2.0	2.0	21.0	17.9	24.2			
Ti		[2000]			[2000]					
V	5.0	(0.5)	-9.5	10.5	(19.0)	9.0	29.0			
Zn	5.0	(11.0)	1.0	21.0	(29.0)	19.0	39.0			

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

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

ICSA: M5873

RD: 07/14/2022



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

Instructions for QATS Reference Material: ICP-MS ICS

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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".

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



Page 1 of 2



ICSB: M5874

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

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

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

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

	Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-MS ICSA-0803, AND ICSA-0803 MIXED WITH ICSB-0803									
Element	CRQL	Part A (µg/L)	Part A Limit Limit +Par		Part A +Part B (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)			
AI	20.0	[100000]			[100000]					
Sb	2.0	(1.5)	-2.5	5.5	(22.0)	18.0	26.0			
As	1.0	(0.1)	-1.9	2.1	19.0	16.2	21.9			
Ba	10.0	(1.2)	-18.8	21.2	(22.0)	2.0	42.0			
Be	1.0	(0)	-2.0	2.0	19.0	16.2	21.9			
Cd	1.0	(0.7)	-1.3	2.7	20.0	17.0	23.0			
Ca	500	[100000]			[100000]					
С		[200000]			[200000]					
CI		[1000000]			[1000000]					
Cr	2.0	(21.0)	17.0	25.0	40.0	34.0	46.0			
Co	1.0	(1.0)	-1.0	3.0	20.0	17.0	23.0			
Cu	2.0	(8.0)	4.0	12.0	(25.0)	21.0	29.0			
Fe	200	[100000]			[100000]					
Pb	1.0	(4.0)	2.0	6.0	25.0	21.3	28.8			
Mg	500	[100000]			[100000]					
Mn	1.0	(7.0)	5.0	9.0	27.0	23.0	31.1			
Мо		[2000]			[2000]					
Ni	1.0	(6.0)	4.0	8.0	24.0	20.4	27.6			
Р		[100000]			[100000]					
K	500	[100000]			[100000]					
Se	5.0	(0.3)	-9.7	10.3	(19.0)	9.0	29.0			
Ag	1.0	(0)	-2.0	2.0	18.0	15.3	20.7			
Na	500	[100000]			[100000]					
S		[100000]			[100000]					
TI	1.0	(0)	-2.0	2.0	21.0	17.9	24.2			
Ti		[2000]			[2000]					
V	5.0	(0.5)	-9.5	10.5	(19.0)	9.0	29.0			
Zn	5.0	(11.0)	1.0	21.0	(29.0)	19.0	39.0			

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

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

ICSA: M5873

N 55 10 0	m/z-> 110 5.0E6	រា .0 ៣ ភា	m/≥-> 10	ហ .0 ៣ ៥	[1] Spectrum No.1 1.0E7	1. Silver nitrate (Ag)	Compound	Part Number: 57047 Lot Number: 122823 Description: Silver (A Description: Silver (A Expiration Date: 122826 Recommended Storage: Ambient (; Nominal Concentration (µg/mL): 1000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT:
	120		N.		-	5 J0612AGA1	Lot Nor RM# Number Conc. (57047 122823 Silver (Ag) 122826 Ambient (20 Ambient (20 1000 6UTB 6UTB	-
	130 140		90 40		14.044 sec]:58147.D# [Count] [Linear]	88.8988 0.10	Nominal Purity Uncertainty Assay Conc. (Jug/mL) (96) Purity (96) (96)	*C) 5E-05 Balance Uncertainty	Certified I R 1 8 5 2 4
	1 ភូ- O		50		[Count] [Linear]	6.27992	Target Weight (g)	n t: 24002546 2% 80.0 (mL)	Certified Reference Material
	160 170		60 70			1000.0	Actual Actual U Weight (g) Conc. (µg/mL) +	Nitric Acid	rial CRM M6030
	180		80			2.0 7761-88-8	Expanded Uncertainty (Solv +/- (µg/mL) CAS#	ad By:)30
	190 200		90 100			10 ug/m3	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD51	Benson Chan Pedro L. Rentas	http
	ŏ		ŏ				n ached pg.) NIST LD50 SRM	122823	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

Part # 57047 Lot # 122823

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

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

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

Physical Characterization:

(T)= Target analyte

Certified by:

In & She

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

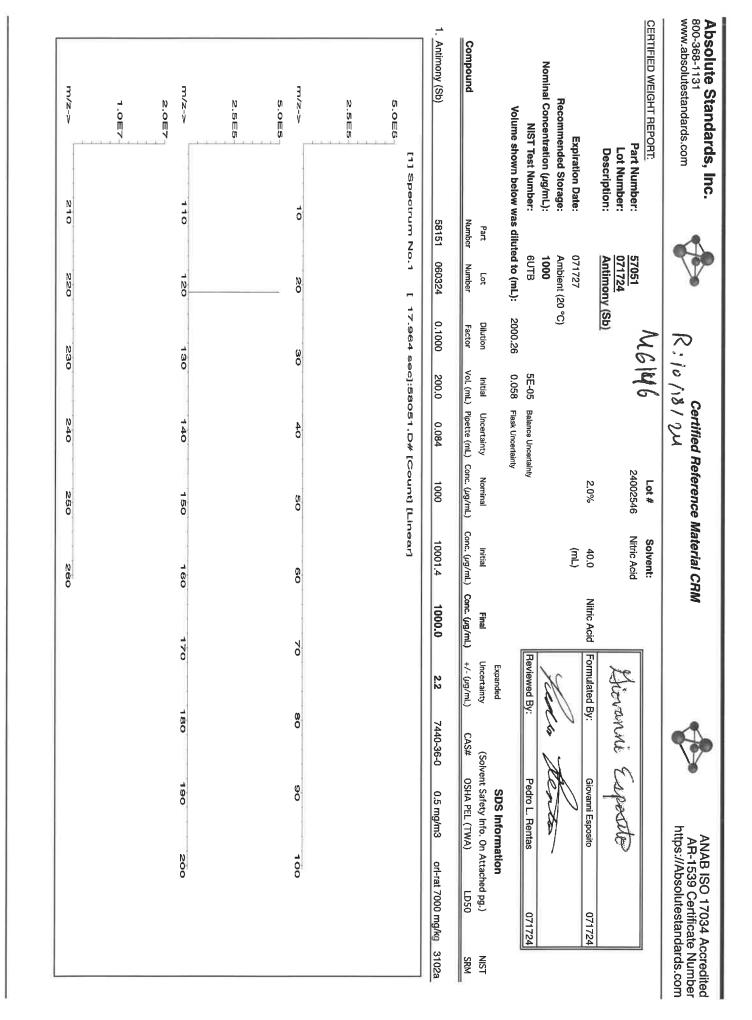
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* All standard containers are meticulously cleaned prior to use.

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

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



Certified Reference Material CRM



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

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

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(T) = Target analyte

Physical Characterization:

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

Son P. Mar

Certified by:

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

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Certificate of Analysis

R: 8/5/24 M6019

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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

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

Assay Information:

3.0

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

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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М	Er	<	0.000495	М	Мо	<	0.001980	М	Sc	<	0.001980	М	Yb	<	0.000495				

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

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 11.0

11.1 Certification Issue Date

March 03, 2023

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

11.2 Lot Expiration Date

- March 03, 2028

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

NAMES AND SIGNATURES OF CERTIFYING OFFICERS 12.0

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

BD9784.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT:	Par Loi De	Expiration Date: Recommended Storage:	NIST Tex	Weight showr		Compound		N. O	1.000	m/z->	1.0E4	5 0 0	m/z->-	1.0世8	5. 0 8	ITVZ->
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Part # 57081 Lot # 062724

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

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

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(I) = Target analyte

Physical Characterization:

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

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

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com		Part Number: 57023 Lot Number: 062424 Description: Vanadium (V)	Expiration Date: 062427		vas dilut	Part Lot Dilution	Compound Number Number Factor	[1] Spectrum No.1 [34.243 2.0E6		m/z->- 10 20	2.067	1.027	m/z->- 110 120 1	2.588	
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Lot # 062424

Part # 57023





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

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

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

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

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