

Prep Standard - Chemical Standard Summary

Order ID :Q1200Test :Metals CLP MS

Prepbatch ID : PB166435,

Sequence ID/Qc Batch ID: LB134612,

Standard ID :

MP84041,MP84042,MP84043,MP84044,MP84045,MP84046,MP84047,MP84048,MP84049,MP84050,MP84052,MP840 53,MP84054,MP84055,MP84056,MP84057,MP84073,MP84074,MP84099,MP84297,MP84378,MP84414,MP84493,MP 84583,

Chemical ID :

M5192,M5288,M5289,M5298,M5304,M5472,M5476,M5496,M5497,M5498,M5513,M5516,M5519,M5658,M5697,M5739,M5751,M5768,M5798,M5799,M5800,M5801,M5802,M5806,M5815,M5816,M5817,M5819,M5820,M5873,M5874,M5961,M5962,M5976,M5978,M5981,M5983,M5993,M5999,M6021,M6023,M6025,M6028,M6030,M6032,M6055,M6121,M6126,M6127,M6128,M6146,M6150,W3112,



Recipe ID 169	NAME 1:1HNO3	<u>NO.</u> <u>MP84041</u>	Prep Date 01/14/2025	Expiration Date 07/14/2025	<u>Prepared</u> <u>By</u> Eman Mughal	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
<u>FROM</u>	1250.00000ml of M6126 + 1250.0000	00ml of W31	112 = Final Q	uantity: 2500.0	00 ml			
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u> Mohan Bera

1122	ICPMS CALIB	MP84042	01/14/2025	02/07/2025	Sarabjit Jaswal	None	METALS PIP	
	BLANK(S0/ICB/CCB)				,	-	ETTE_3 (A)	01/16/2025
FROM	25.00000ml of M6121 + 4925.00000r	ml of W3112	2 + 50.00000m	nl of M6126 =	Final Quantity: 5	000.000 ml		
		BLANK(S0/ICB/CCB)						



Recipe ID 3947	NAME S7(SFAM,6020,200.8)	<u>NO.</u> MP84043	Prep Date 01/14/2025		<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025
FROM	1.00000ml of M5476 + 1.00000ml of of M5976 + 10.0000ml of M5978 + + 4.00000ml of M6032 + 4.90000ml 830.60000ml of W3112 + 9.00000ml 9.90000ml of M5806 + 9.90000ml of	10.00000ml of M5298 + of M5751 +	of M6126 + 2 4.90000ml of 9.00000ml of	.00000ml of M M5519 + 5.000 M5819 + 9.000	5815 + 2.00000r 00ml of M6121	ml of M5817 + 4 + 50.00000ml c	4.00000ml of M of M5304 +	

<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By
3948	S6(SFAM,6020,200.8)	<u>MP84044</u>	01/14/2025		Sarabjit Jaswal	None	METALS_PIP ETTE_3 (A)	Mohan Bera 01/16/2025
FROM	l 0.50000ml of M6121 + 1.00000ml of	I M6126 + 48	I 8.50000ml of V	N3112 + 50.00	I I 000ml of MP840	43 = Final Qua	I I	



<u>Recipe</u> <u>ID</u> 3949	<u>NAME</u> S5(SFAM,6020,200.8)	<u>NO.</u> MP84045	Prep Date 01/14/2025	Expiration Date 02/07/2025	<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025
FROM	0.50000ml of M6121 + 1.00000ml of	M6126 + 73	50000ml of V	V3112 + 25.000	000ml of MP840	43 = Final Qua	antity: 100.000	mi
Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	<u>Supervised By</u> Mohan Bera

3954	S4(SFAM,6020,200.8)	<u>MP84046</u>	01/14/2025	02/07/2025	Sarabjit Jaswal	None	METALS_PIP ETTE_3 (A)	01/16/2025
<u>FROM</u>	0.50000ml of M6121 + 1.00000ml of	M6126 + 86	6.00000ml of V	V3112 + 12.50	000ml of MP840	43 = Final Qua	antity: 100.000 r	nl



Recipe ID 3951 FROM	NAME S3(SFAM, 6020,200.8) 0.50000ml of M6121 + 1.00000ml of	<u>NO.</u> <u>MP84047</u> M6126 + 88	Prep Date 01/14/2025 .50000ml of V		Prepared By Sarabjit Jaswal		PipetteID METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025 ml
<u>Recipe</u> <u>ID</u> 3955	NAME S2CONC(SFAM,6020,200.8)	<u>NO.</u> MP84048	Prep Date 01/14/2025	<u>Expiration</u> <u>Date</u> 02/07/2025	Prepared By Sarabjit Jaswal	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025

 FROM
 0.05000ml of M5476 + 0.05000ml of M5798 + 0.05000ml of M5800 + 0.05000ml of M5801 + 0.05000ml of M5961 + 0.05000ml of M5981 + 0.05000ml of M5983 + 0.05000ml of M6023 + 0.05000ml of M6025 + 0.05000ml of M6028 + 0.05000ml of M6030 + 0.05000ml of M6128 + 0.10000ml of M5496 + 0.10000ml of M5658 + 0.10000ml of M5751 + 0.10000ml of M5802 + 0.25000ml of M5298 + 0.25000ml of M5799 + 0.25000ml of M5819 + 0.25000ml of M5962 + 0.25000ml of M5976 + 0.25000ml of M5978 + 0.25000ml of M6021 + 0.50000ml of M6032 + 2.00000ml of M5815 + 2.0000ml of M5817 + 2.50000ml of M5498 + 2.50000ml of M6121 + 2.50000ml of M6127 + 225.25000ml of W3112 + 5.0000ml of M6126 = Final Quantity: 250.000 ml



Recipe ID 3956	<u>NAME</u> S2(SFAM,6020,200.8)	<u>NO.</u> MP84049	Prep Date 01/14/2025	Expiration Date 02/07/2025	<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025
<u>FROM</u>	0.50000ml of M6121 + 1.00000ml of	M6126 + 98	.00000ml of V	V3112 + 0.500(Doml of MP8404	8 = Final Quar	ntity: 100.000 r	nl
Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u> Mohan Bera

שו	NAME	<u>NO.</u>	Prep Date	Date	<u>BY</u>	ScaleID	PipettelD	Mohan Bera
3957	S1(SFAM,6020,200.8)	<u>MP84050</u>	01/14/2025	02/07/2025	Sarabjit Jaswal	None	METALS_PIP ETTE_3 (A)	01/16/2025
FROM	0.50000ml of M6121 + 1.00000ml of	M6126 + 88	50000ml of \	N3112 + 10 000	000mL of MP840	49 = Final Qua	II	
		10120 - 00		10.000			inity. 100.000	



Recipe ID 3961	NAME CCV	<u>NO.</u> MP84052	Prep Date 01/14/2025		<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025
FROM	0.20000ml of M5513 + 0.50000ml of of M5815 + 1.00000ml of M5817 + 10 M6032 + 24.95000ml of M5498 + 24. + 4.50000ml of M5819 + 4.50000ml of 830.60000ml of W3112 = Final Quar	0.00000ml of 95000ml of of M6128 +	of M6126 + 12 M5806 + 24.9 4.95000ml of	.45000ml of M8 95000ml of M6	5298 + 12.45000 127 + 25.00000r	oml of M5519 + nl of M5304 + 4	2.00000ml of 4.50000ml of M	

<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>	Supervised By
<u>1142</u>	ICSA ICPMS	<u>MP84053</u>	01/14/2025		Sarabjit Jaswal	None	METALS_PIP	Mohan Bera
							ETTE_3 (A)	01/16/2025
FROM	10.00000ml of M5873 + 90.00000ml	of MP84042	2 = Final Qua	ntity: 100.000	ml			



<u>Recipe</u> <u>ID</u> 1143	NAME ICSAB ICPMS	<u>NO.</u> MP84054	Prep Date 01/14/2025		<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	
FROM	10.00000ml of M5873 + 10.00000ml	of M5874 +	80.00000ml c	of MP84042 =	Final Quantity: 1	00.000 ml		

<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>	PipetteID	Mohan Bera
3962	MG 10PPM FOR TUNE	<u>MP84055</u>	01/14/2025	02/07/2025	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	01/16/2025
FROM	0.01000ml of M6127 + 9.99000ml of	MP84042 =	Final Quanti	ty: 100.000 ml				



Recipe ID 3894 FROM	NAME TUNE 200PPB 2.00000ml of M6055 + 2.00000ml of	<u>NO.</u> <u>MP84056</u> MP84055 +	Prep Date 01/14/2025 96.00000ml d		Prepared By Sarabjit Jaswal Final Quantity: 1	ScaleID None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025
Recipe ID 3903	NAME ISS 3PPM	<u>NO.</u> <u>MP84057</u>	Prep Date 01/14/2025	Expiration Date 02/07/2025	<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Supervised By Mohan Bera 01/16/2025



Recipe ID 2902	NAME S8 ICPMS	<u>NO.</u> MP84073	Prep Date 01/14/2025	Expiration Date 02/07/2025	Prepared By Janvi Patel	<u>ScaleID</u> None	PipetteID None	Supervised By Mohan Bera 01/16/2025
FROM	1.00000ml of M5496 + 2.50000ml of of M6127 + 79.00000ml of MP84042)ml of M5497 +	5.00000ml of M	5806 + 5.0000	lÕml
Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	PipettelD	Supervised By

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
870	ICPMS SPIKE SOL.B	<u>MP84074</u>	01/16/2025	02/07/2025	Janvi Patel	None	METALS_PIP	
							ETTE_3 (A)	01/17/2025
FROM	0.45000ml of M5962 + 5.00000ml of	M5993 + 5.	00000ml of M	5999 + 39.5500	0ml of MP8404	2 = Final Quar	ntity: 50.000 m	I



Recipe ID 3963	NAME CONC.LCSW SPIKE	<u>NO.</u> MP84099	Prep Date 01/16/2025	Expiration Date 02/07/2025	<u>Prepared</u> <u>By</u> Janvi Patel	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	0.05000ml of M5472 + 0.05000ml of of M5981 + 0.05000ml of M5983 + 0. 0.10000ml of M5289 + 0.10000ml of of M5819 + 0.25000ml of M5962 + 0. 1.00000ml of M5298 + 1.25000ml of of M5516 + 2.50000ml of M5519 + 2. 250.000 ml	.05000ml of M5658 + 0. .25000ml of M5816 + 1.	M6023 + 0.05 10000ml of M M5978 + 0.25 25000ml of M	5000ml of M602 5697 + 0.10000 5000ml of M602 5820 + 1.25000	25 + 0.05000ml 0ml of M5802 + 21 + 0.25000ml 0ml of M6121 +	of M6028 + 0.0 0.25000ml of M of M6128 + 0.5 2.50000ml of M	5000ml of M60 15799 + 0.2500 0000ml of M60 15497 + 2.5000	30 + 0ml 32 + 0ml

<u>Recipe</u> <u>ID</u> 170	NAME 1:1HCL	<u>NO.</u> <u>MP84297</u>	Prep Date 01/31/2025		<u>Prepared</u> <u>By</u> Eman Mughal	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	1250.00000ml of M6121 + 1250.0000	00ml of W31	I I12 = Final Q	uantity: 2500.0	ı <u> </u>			



<u>Recipe</u> <u>ID</u> 1883	NAME SE 10PPM	<u>NO.</u> MP84378	<u>Prep Date</u> 02/05/2025	Expiration Date 02/07/2025	<u>Prepared</u> <u>By</u> Sarabjit Jaswal	<u>ScaleID</u> None	PipetteID None	Supervised By Mohan Bera 02/07/2025
<u>FROM</u>	0.10000ml of M5962 + 9.90000ml of	MP84042 =	- Final Quanti	ty: 10.000 ml				
Recipe	NAME	NO	Bron Data	Expiration	Prepared By	ScalolD	BinottolD	Supervised By

Recipe				Expiration	Prepared			<u>Supervised By</u>
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sohil Jodhani
1122	ICPMS CALIB BLANK(S0/ICB/CCB)	<u>MP84414</u>	02/07/2025	02/28/2025	Janvi Patel	None	METALS_PIP ETTE_3 (A)	02/11/2025
FROM	10.00000ml of M6126 + 175.00000m	l of W3112	+ 5.00000ml c	of M6121 = Fin	al Quantity: 100	0.000 ml		



Recipe ID 1027 FROM	NAME SB 1PPM 0.01000ml of M6146 + 9.99000ml of	<u>NO.</u> <u>MP84493</u> MP84414 =	Prep Date 02/06/2025 Final Quanti	Expiration Date 02/28/2025 ty: 10.000 ml	Prepared By Janvi Patel	<u>ScaleID</u> None	PipettelD None	Supervised By Kareem Khairalla 02/13/2025
Recipe ID 3958	NAME ICV(SFAM)	<u>NO.</u> MP84583	Prep Date 02/06/2025	Expiration Date 02/28/2025	Prepared By Sagar Kanani	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_3 (A)	

FROM

0.50000ml of M5192 + 1.25000ml of M5472 + 2.00000ml of M6150 + 96.25000ml of MP84414 = Final Quantity: 100.000 ml



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CHEMICAL RECEIPT LOG BOOK

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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	051722	05/17/2025	07/01/2022 / bin	06/17/2022 / jaswal	M5192
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	071122	07/11/2025	09/01/2022 / jaswal	07/21/2022 / jaswal	M5288
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Aluminum (Al) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289
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	020422	02/04/2025	05/02/2023 / jaswal	06/15/2022 / jaswal	M5298
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	08/07/2024 / jaswal	04/01/2022 / jaswal	M5304
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #

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	01/14/2025 / Jaswal	03/16/2023 / jaswal	M5472



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CHEMICAL RECEIPT LOG BOOK

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57138 / Sr, 10000 PPM, 125 ml	082922	08/29/2025	07/29/2024 / jaswal	03/16/2023 / jaswal	M5476
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Al, 10000 PPM, 500 ml	011623	01/16/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5496
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	03/18/2023 / bin	03/17/2023 / bin	M5497
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5498
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	061522	06/15/2025	03/19/2023 / bin	03/17/2023 / bin	M5513
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	022123	11/06/2025	11/06/2024 / kareem	03/17/2023 / bin	M5516



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	120822	12/08/2025	01/08/2024 / bin	03/17/2023 / bin	M5519
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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
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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	091823	09/18/2026	01/08/2024 / bin	01/03/2024 / bin	M5768



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.	57051 / Sb, 1000 PPM, 125 ml	120523	12/05/2026	08/07/2024 / jaswal	01/03/2024 / jaswal	M5802

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	122223	12/22/2026	08/01/2024 / Jaswal	01/03/2024 / jaswal	M5806



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	041723	04/17/2026	05/21/2024 / Jaswal	02/09/2024 / jaswal	M5815
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	122923	12/29/2026	05/20/2024 / Jaswal	02/09/2024 / jaswal	M5816
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	071123	07/11/2026	03/01/2024 / jaswal	02/09/2024 / jaswal	M5817
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	111623	11/16/2026	03/20/2024 / jaswal	02/09/2024 / jaswal	M5819
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57015 / P, 1000 PPM, 125 ml	091123	09/11/2026	05/01/2024 / jaswal	02/09/2024 / jaswal	M5820
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 #
EPA	PART A / ICSA (ICPMS) STOCK SOLN	CP-MS ICSA-0803	04/30/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5873



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSB (ICPMS) STOCK SOLUTION	CP-MS ICSB-0803	04/30/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5874

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57028 / Ni, 1000 PPM, 125 ml	041124	04/11/2027	07/02/2024 / Jaswal	06/11/2024 / Jaswal	M5961

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	060624	06/06/2027	07/02/2024 / Jaswal	06/14/2024 / Jaswal	M5962

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGMO1-1 / MOLYBDENUM 125mL 1000ug/mL	T2-MO720876	07/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5976

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGTI1-1 / TITANIUM 125mL 1000ug/mL	T2-TI719972	06/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5978

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / 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.	57040 / Zr, 1000 PPM, 125 ml	071423	07/14/2026	07/29/2024 / Jaswal	06/11/2024 / Jaswal	M5983
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-SPK-4 / SOIL/WATER SPIKE SOLN 4, 125mL	V2-MEB742036			02/22/2024 / Jaswal	M5993
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-SPK-1 / SOIL/WATER SPIKE SOLN 1, 125mL	T2-MEB721963	07/27/2027	09/04/2024 / Jaswal	02/22/2024 / kareem	M5999
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 062424 ml		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	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	
Sumplier	ltem Code / Item Neme	L at #	Expiration	Date Opened /	Received Date /	Chemtech	

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	IV-STOCK-12 / ICP-MS TUNING SOLUTION, 125mL	U2-MEB734294	06/21/2028	08/21/2024 / Jaswal	08/19/2024 / Jaswal	M6055

ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	0000275677	05/13/2025	11/13/2024 / Eman	10/13/2024 / Eman	M6121
	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed	BA-9530-33 / Hydrochloric 0000275677 Acid, Instra-Analyzed	ItemCode / ItemNameLot #DateBA-9530-33 / Hydrochloric000027567705/13/2025Acid, Instra-Analyzed000027567705/13/2025	ItemCode / ItemNameLot #DateOpened ByBA-9530-33 / Hydrochloric000027567705/13/202511/13/2024 / EmanAcid, Instra-AnalyzedEman	ItemCode / ItemNameLot #DateOpened ByReceived ByBA-9530-33 / Hydrochloric000027567705/13/202511/13/2024 /10/13/2024 /Acid, Instra-AnalyzedEmanEman

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	06/03/2025	12/03/2024 / Janvi	11/12/2024 / Janvi	M6126



CHEMICAL RECEIPT LOG BOOK

Supplier			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			01/13/2025 / kareem	M6128
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	DIW / DI Water	Daily Lab-Certified	07/03/2029	07/03/2024 / Iwona	07/03/2024 / Iwona	W3112



Certificate of Analysis M5991 M5992 M5983 M5994

50.00 ± 0.22 µg/mL

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).

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2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custon	n Grade Solution	
Catalog Number:	CLPP-SPK-4		
Lot Number:	V2-MEB742036		
Matrix:	3% (v/v) HNO3		
Value / Analyte(s):	100 μg/mL ea: Antimony,		
	50 μg/mL ea: Cadmium,		Thallium,
	40 µg/mL ea: Arsenic,		
	20 µg/mL ea: Lead,		
	10 µg/mL ea: Selenium		
CERTIFIED VALUES AI	ND UNCERTAINTIES	5	
	ERTIFIED VALUE 00.0 ± 0.7 µg/mL	ANALYTE Arsenic, As	CERTIFIED VALUE 40.00 ± 0.26 µg/mL
Cadmium, Cd 5	0.00 ± 0.22 μg/mL	Lead, Pb	20.00 ± 0.09 µg/mL

Selenium, Se

3.0

Density:

1.016 g/mL (measured at 20 ± 4 °C)

Thallium, Ti

 $10.00\pm0.04~\mu\text{g/mL}$

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
As	ICP Assay	3103a	100818
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Pb	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
Se	ICP Assay	3149	100901
Se	Calculated		See Sec. 4.2
TI	ICP Assay	3158	151215
TI	Calculated		See Sec. 4.2

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

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

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

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

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

k = coverage factor = 2

$$\begin{split} & u_{char} = [\overline{\Sigma_i}(w_i)^2 (u_{char_i})^2]^{V_2} \text{ where } u_{char_i} \text{ is re the errors from each characterization method} \\ & u_{bb} = \text{bottle to bottle homogeneity standard uncertainty} \\ & u_{rts} = \text{long term stability standard uncertainty (storage)} \end{split}$$

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:

$$\begin{split} & \mathsf{X}_{\mathsf{CRM/RM}} = (\mathsf{X}_{\mathbf{a}}) \; (u_{\mathsf{char } \mathbf{a}}) \\ & \mathsf{X}_{\mathbf{g}} = \mathsf{mean} \; \mathsf{of} \; \mathsf{Assay} \; \mathsf{Method} \; \mathsf{A} \; \mathsf{with} \\ & \mathsf{u}_{\mathsf{char } \mathbf{a}} = \mathsf{ihe} \; \mathsf{standard} \; \mathsf{uncertainty} \; \mathsf{of} \; \mathsf{characterization} \; \mathsf{Method} \; \mathsf{A} \end{split}$$

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k ($u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts}$)^½ k = coverage factor = 2 uchar a = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = tansport 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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 12, 2024

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

11.2 Lot Expiration Date

- March 12, 2029

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

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

11.3 Period of Validity

- Sealed TCT 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:

Joseph Burns Custom VS Manager

Paul R Saine

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

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
0 0		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
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		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

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 ⁶		[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 S 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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vte	4012	20.02	5	<0.02	<0.02		<0.02	<0.02	10.02	c0 0>	一般であるの		55
	Sc	2m	2	R	Rb		R	Re		ę		MU C	
	40.02	20.02	3	<0.02	40.02	10.00	300	<0.02	10.04	con		ug/mL)	
	Ta	c,	>	ş	Na	9.0	A۵	2	00	2	SUMPLICATION OF		
	A0,02	<0.02		40.02	<0.2	10.01	33	<0.02	10.4	3	III N SOLVER WILL S		
	H	S		j	Th		3	Te	01	1			
	<0.02	<0.02	10.01	<h m<="" td=""><td><0.02</td><td>10.02</td><td>3</td><td><0.02</td><td>20.05</td><td>200</td><td></td><td></td><td></td></h>	<0.02	10.02	3	<0.02	20.05	200			
	27	20	÷	<	4	v	4	d	×		Constant of the		
	<0.02	<0.02	10.01	200	<0.02	20.05	2	40.02	20.02		State and a state of the state		

Physical Characterization:

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

In P. S.

Certified by:

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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	-	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	Expanded SDS information al 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]	
5. 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
7 0 17 7			
	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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Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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AI	Am	3	AB	7	3	цг	33	:	3	NE	2		200	2					
3		1		1				ţ	10.02	3	10.02	1.1	20.02	ő	70>	01	20.02	¥	20.05
S	4 0.02	ß	<0.2	ц,	<0.02	Но	40.02	E	<0.02	Å	<0.02	Re	<0.02	Si	A0.02	P	<0.02	9	40.02
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
Ba	A0.02	S	40.02	ନ୍ଥ	<0.02	7	40.02	5	30	¥	3	Ŗ	3	ξ,	5	7	5	\$.	
5	2	2		2						1					10.00	***	70.02	71	10.02
Ве	10.05	۵ ۵	<0.02	Ga	<0.02	F	40,2	ЯH	40.2	٩	<0.02	Ru	<0.02	ş	⊲ 0.02	F	<0.02	~	A0.02
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	7n	Ang N
₿	<0.02	Q	4 0.02	Au	<0.02	\$	т	M	<0.02	ĸ	<0.2	Sc	<0.02	Ţ	40,02	3	40.02	7	20.02

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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m/z->	1.0E6	2.0E6	m/z->	1000	2000		1.0E5	2.065	1. Ammonium molybdate (Mo)	Compound	Volume show	NIST Tes	Recommended Storage: Nominal Concentration (µg/mL):	Expire	Part Lot Des	CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
210			110		ā			[1] Spectrum No.1		Nur	vn below was o	NIST Test Number:	d Storage: n (µg/mL):	Expiration Date:	Part Number: Lot Number: Description:		s, Inc.
)			120		Ň			No.1	58142 022222	Part Lot Number Number	Volume shown below was diluted to (mL):	6UTB	Ambient (20 °C) 1000	051725	57042 051722 Molybde		-
								8.594	0.1000	Dilution Factor	3000.41		20 °C)		<u>57042</u> <u>051722</u> Molybdenum (Mo)		
			130		ŭ			sec]:5704	300.0	Initial Un Vol. (mL) Pip	0.058 Flas	5E-05 Bala					M.S.
			140		40	-		8.594 sec]:57042.D# [Count] [Linear]	0.084	Uncertainty N Pipette (mL) Conc	Flask Uncertainty	Balance Uncertainty			MKE	_	Certified Re
			150		50			unt] [Líne	1000	Nominal Conc. (µg/mL) Co				0.5%	MKBQ8597V Am	Lot #	ference M.
			160		80			ar]	10001.0	Initial Conc. (µg/mL) C				15.0 ×	Ammonium hydroxide		Certified Reference Material CRM いちいのえいたいのんりはてい
			170		070				1000.0	Final Conc. (µg/mL)	Г		un - 1 contrition came	Ammonium hydroxide	8	1	M 172
									2.1	Expanded Uncertainty +/- (µg/mL)		Reviewed By:	K	Formulated By:	A		
			180		80				13106-76-8	(Solve CAS#			to I		derone		•
			190		90				5 mg(Mo)/m3	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		Pedro L. Rentas	er	Lawrence Barry	An		nt 、
			200		100				3 orl-rat 333 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50		s 051722	/	ry 051722	Ψ		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
					<u></u>				(g 3134	NIST		722		722	<u> </u>		1 Accredite ate Numbe ndards.cor

Part # 57042 Lot # 051722

1 of 2

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Certified Reference Material CRM



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

							Trace M	letals	Verifica	ition	by ICP-N	IS (µ	g/mL)						
A	<0.02	ß	40.02	Dv	20.02	Ηŕ	3	1		1									
SP SP	A).02	Ĵ,	2.0	7 5	10.02	1	<0.02	' E	20.02	N	<0.02	P	<0.02	Se	<0.2	4L	<0.02	W	<0.02
<u>,</u>		2	10.2	5	20.02	Ho	<0.02	Lu	<0.02	ß	<0.02	Re	<0.02	Si	40.02	5	<0.02	11	4000
2	202	ŝ	20.02	En	<0.02	h	<0.02	Mg	<0.01	ò	<007	Rh	50	۸,	2003	3	3	: (
Ba	40.02	S	<0.02	2	300	7	3	ξ,	2	2			10.02	26	70.02		20.02	<	20.02
Be	5	?	3	> (20.02	l =	70.02	UTAT	20.02	Pd	<0.02	Rb	<0.02	Na	40.2	Ц	<0.02	ΥЪ	<0.02
	-	2	70.02	Ua	<0.02	He	<02	Hg	40.2	P	<0.02	Ru	<0.02	S	40.02	Ţ	300	<	2003
Id	20.02	6	40.02	ଜ	<0.02	5	40.02	Mo	÷	¥	2003	ŝ	202	0	5	>		1,	10104
ω	40.02	6	<0.02	An	3	ş	3	E		; ;	TO'NE	UH	70.02	0	20.05	SI	20.02	5	<0.02
					10.01	0.1	20.05	ING	20.02	~	40.2	Sc	<0.02	Ta	<0.02	П	<0.02	72	<0.02
																			Non- Non- of Concession, Name of Concession, N

(T)= Target analyte

Physical Characterization:

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

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Certified by:

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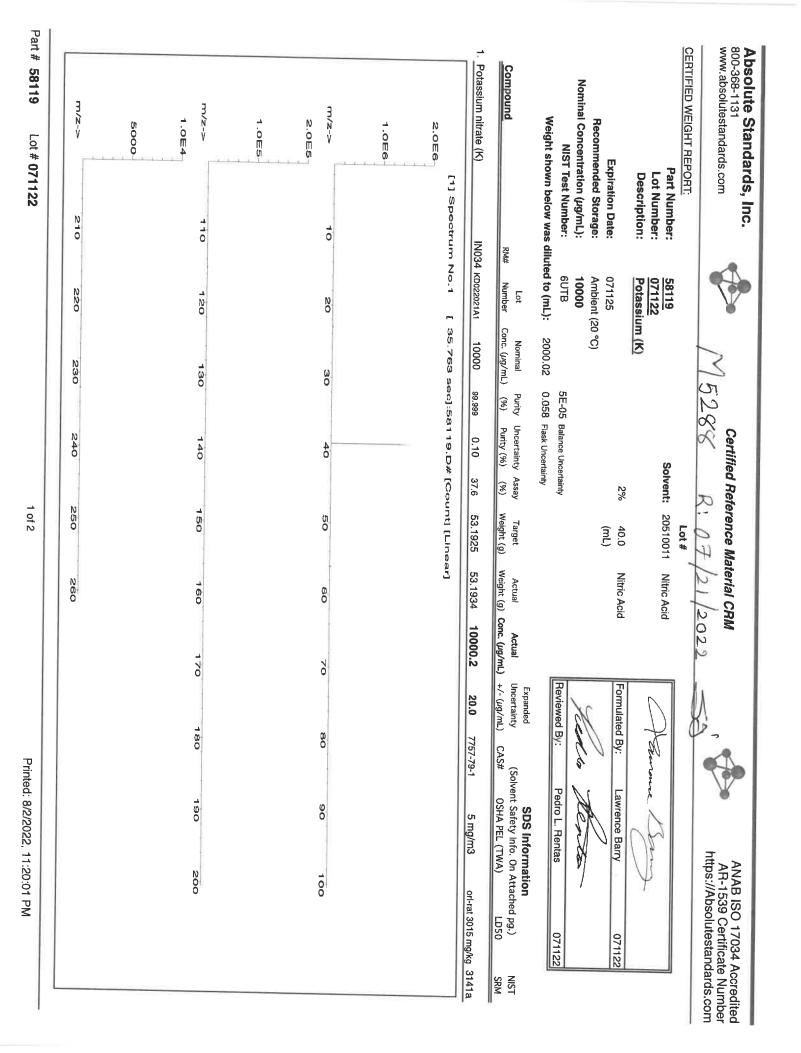
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Part # 57042 Lot # 051722



Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com		Certified Reference Material CRM	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
Instrumental Analysis by In	ductively Coupled Pla	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	
		Trace Metals Verification by ICP-MS (μ g/mL)	
	2		
AI <0.02 Cd <0.02 Sb <0.02	Dy <0.02 Hf Er <0.02	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Physical Characterization:		(T)= Target analyte	Certified by:
Homogeneity: No heterogeneity was observed in the preparation of this standard.	s observed in the preparation	ı of this standard.	for R. S.
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Part # 58119

Lot # 071122



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



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

							race Me	etais	Verifica	ation	by ICP-	MC (hg/mr)						
							-0110-												
Al	Т	G	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	77	<0.02	Se	<0.2	Ъ	<0.02	W	<u>6</u> .0
Sр	<0.02	ß	<0.2	막	<0.02	Но	<0.02	Ŀ	<0.02	Nb	<0.02	Re	<0.02	ŝ	<0.02	Te	40.02		<0.02
As	<0.2	င့	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	^S 0	<0.02	Rh	<0.02	Ag	<0.02		40.02	V	4
Ba	<0.02	ß	<0.02	Gd	<0.02	١r	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Þ	<0.02	Υ γ	4
Be	<0.01	Ω	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	ş	40.02	Jm	40.02	¥	
B:	<0.02	S	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	₽	<0.02	Sm	<0.02	s	<0.02	2	<0.02	7	4
B	<0.02	С ¹	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	×	<0.2	Ş	<0.02	Ta	<0.02	Ţ.	<0.02	27	A)

Physical Characterization:

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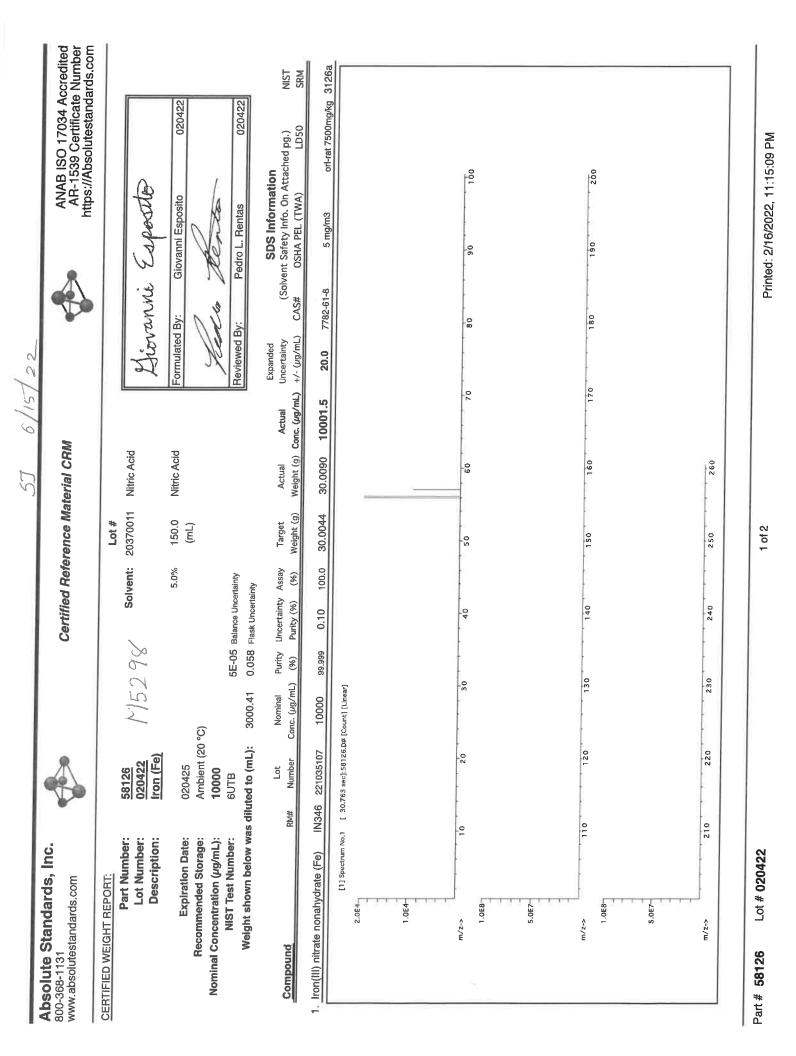
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Absolute Standards, Inc. www.absolutestandards.com 800-368-1131





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

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

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507	c	0.00	i,	10.04	2	70.02	T'I	<0.02	٩Ż	<0.02	Re	<0.02	55	<0.02	ť	2007	11	001
7.02	ŋ	<0.02	립	<0.02	In	<0.02	Mo	/0.01	ć	000	ē				2	10.02	>	20.02
<0.02	ڒ	1002	2	000			9	10.04	ŝ	70.02	2	<0.02	Ag	<0.02	Ħ	≤0.02	>	<0.0>
	3	70.04	3	<0.UZ	4	<0.02	Mn	<0.10	Ρd	<0.02	Rh	<0.02	٩Ŋ	102	É	200		
<0.01	გ	<0.5	g	<0.02	Ц.	C 02	'n,		¢		1	1000	PLT	7.02	97	<0.02	Υb	<0.0≻
<0.07	ξ	010	ç		,	7.02	217	7.02	<u>ч</u>	<0.02	2	<0.02	S	<0.02	Tm	<0.02	>	700
70.02	3	01.02	35	<0.10	ę	<0.02	мо	<0.02	Ł	<0.02	mS.	2007	U	200	5		' ।	20.00
<0.02	õ	<0.10	Υn	<0.02	fd	<0.02	NA	20.02	1		5	70.02	2	20.02	Ч	<0.02	Z Z	×0.0
							DLT	20.02	4	202	22	<0.02	<u>e</u>	000	ï	2007	1	òç

Physical Characterization:

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

Certified by:

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Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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:

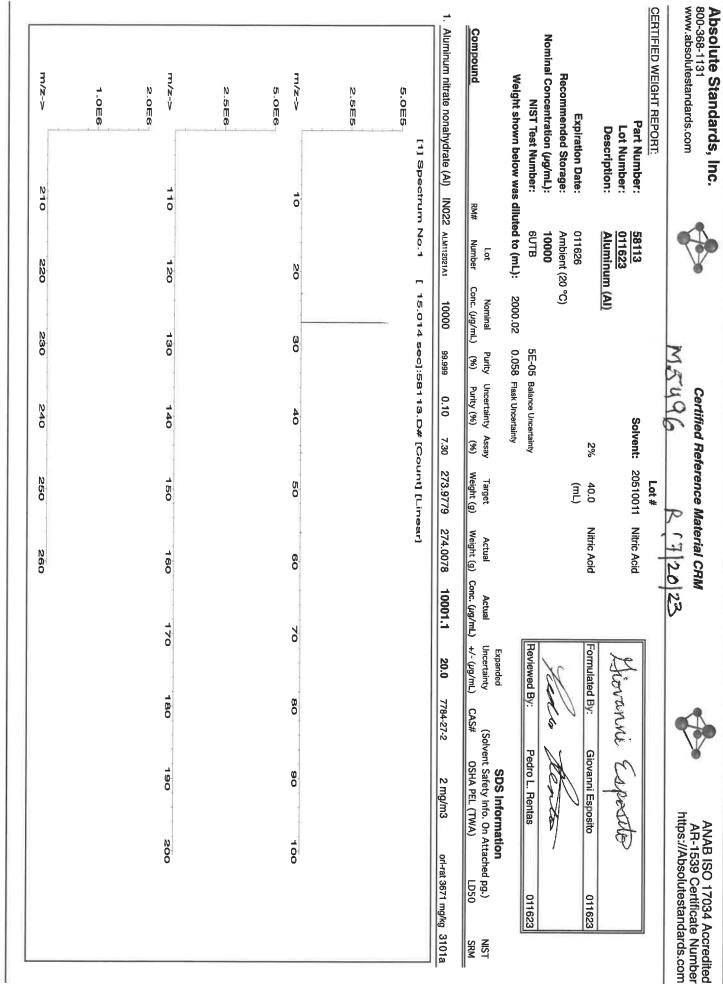
Paul Gaines Chairman / Senior Technical Director

Paul R Line



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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	031523	on ttached pg.) NIST LD50 SRM ont-rat >2000mo/kg 3109a	Ő	O O N
ANA	Ped X Gio	SDS Information (Solvent Safety Info. On Attached pg.) CSHA PEL (TWA) LD5C C	-0 0	190
MUXCITI	Formulated By: Reviewed By:	Expanded Uncertainty +/- (µg/mL) CAS: 20.0 471-34	Q R	170
120		Actual Actual Weight (g) Conc. (ug/mL) 75.2093 10001.4	So	1900 1900 1900
Certified Reference Material CRM	Lot # Solvent: 21110221 2% 60.0 (mL) Uncertainty sentainty	Uncertainty Assay Target Purity (%) (%) Weight (g) 0.10 38.9 75.1990	0.D# [Count] [Line	140 150 240 250
NV5497	5E-05 Balance 00.41 0.058 Flask Un	Nominal Purity Uncertainty Conc. (<i>ug/m</i> L) (%) Purity (%) 10000 99.999 0.10	30 30	- 30 5 7 30 7 30
	58120 031523 031526 031526 Ambient (20 10000 6UTB 6UTB 6UTB	Lot A RM# Number Con	10 To 1 12	220
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: 58120 Lot Number: 031523 Description: 031526 Expiration Date: 031526 Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Compound 1. Calcium carbonate (Ca)	2.0E4 1.0E4 3.0E4 5.0E4 2.5E4	T.OES 1.0ES 5.0E4 m/2-> 2 m/2-> 2 Part # 58120 Lot # 031523

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

Certified Reference Material CRM



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

	<0.02	3	<0.02	ĥ	<0.02	Hf	<0.02	Ц	<0.02	z	<0.02	Ł	<0.02	ŝ	<0.2	£	<0.02	×	<0.02
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	40 12	ථ	40.02	a	40.02	h	<0.02	Mg	±0.01	ő	6 0.02	2	<0.02	Ag	<0.02	F	<0.02	>	<0.02
_	€0.05	ඊ	<0.02	3	40.02	놰	<0.02	Å	€0.02	æ	<0.02	å	<0.02	Na	<0.2	Ę	<0.02	ይ	40.02
	<0.01	q	<0.02	g	40.02	Ę	402	Hg	<0.2	۵.	<0.02	Ru	<0.02	S	€0.02	Ę	<0.02	×	<0.02
	≤0.02	გ	<u>60.02</u>	ප්	40.02	3	0.02	Mo	<0.02	æ	<0.02	Sn	<0.02	S	<0.02	Sn	<0.02	Ŋ	<0.02
	≤0.02	ð	<u>60.05</u>	Au	000	£	<0.02	PN	<u>40.02</u>	Å	40.2	ŝ	<0.02	T.	≤0.02	Ę	<0.02	2	2002

Physical Characterization:

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

Certified by:

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Part # 58120 Lot # 031523

ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	031523	on ttached pg.) NIST LD50 SRM ont-rat >2000mo/kg 3109a	Ő	O O N
ANA	Ped X Gio	SDS Information (Solvent Safety Info. On Attached pg.) CSHA PEL (TWA) LD5C C	- - 0	190 200
MUXCITI	Formulated By: Reviewed By:	Expanded Uncertainty +/- (µg/mL) CAS: 20.0 471-34	Q R	170
120		Actual Actual Weight (g) Conc. (ug/mL) 75.2093 10001.4	So	1900 1900 1900
Certified Reference Material CRM	Lot # Solvent: 21110221 2% 60.0 (mL) Uncertainty sentainty	Uncertainty Assay Target Purity (%) (%) Weight (g) 0.10 38.9 75.1990	0.D# [Count] [Line	140 150 240 250
NV5497	5E-05 Balance 00.41 0.058 Flask Un	Nominal Purity Uncertainty Conc. (<i>ug/m</i> L) (%) Purity (%) 10000 99.999 0.10	30 30 30 30 30 30 30 30 30 30 30 30 30 3	- 30 5 7 30 7 30 7 30
	58120 031523 031526 031526 Ambient (20 10000 6UTB 6UTB 6UTB	Lot A RM# Number Con	10 To 1 12	220
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: 58120 Lot Number: 031523 Description: 031526 Expiration Date: 031526 Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Compound 1. Calcium carbonate (Ca)	2.0E4 1.0E4 3.0E4 5.0E4 2.5E4	T.OES 1.0ES 5.0E4 m/2-> 2 m/2-> 2 Part # 58120 Lot # 031523

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

Certified Reference Material CRM



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

	<0.02	3	<0.02	ĥ	<0.02	Hf	<0.02	Ц	<0.02	z	<0.02	Ł	<0.02	ŝ	<0.2	£	<0.02	×	<0.02
_	<0.02	లి	٣	固	40.02	Bo	40.02	3	<u>60.05</u>	ź	<0.02	Se	<0.02	ŝ	<0.02	Te	<0.02	Þ	40.02
	40 12	ථ	40.02	a	40.02	h	<0.02	Mg	±0.01	ő	20 .0>	2	<0.02	Ag	<0.02	F	<0.02	>	<0.02
_	€0.05	ඊ	<0.02	3	40.02	놰	<0.02	Å	€0.02	æ	<0.02	å	<0.02	Na	<0.2	Ę	<0.02	ያ	40.02
	<0.01	q	<0.02	g	40.02	Ę	402	Hg	<0.2	۵.	<0.02	Ru	<0.02	S	€0.02	Ę	<0.02	×	<0.02
	≤0.02	გ	<u>60.02</u>	ප්	40.02	3	0.02	Mo	<0.02	æ	<0.02	Sn	<0.02	S	<0.02	Sn	<0.02	Ŋ	<0.02
	≤0.02	ð	<u>60.05</u>	Au	000	£	<0.02	PN	<u>40.02</u>	Å	40.2	ŝ	<0.02	T.	≤0.02	Ę	<0.02	Ň	2002

Physical Characterization:

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

Certified by:

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Part # 58120 Lot # 031523

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com				Certified R	Certified Reference Material CRM	aterial CRI	R 103/17	H/2		AN AF https	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Accredited ate Number ndards.com
CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description:	r: <u>57182</u> r: <u>061522</u> n: <u>Lead (Pb</u>)	-		Solvent:	Lot # It: 20510011	Nitric Acid		Lievannie	/ nui E	apertite		
Expiration Date:061525Recommended Storage:Ambient (2)Nominal Concentration (ug/mL):10000NIST Test Number:6UTBWeight shown below was diluted to (mL):	e: 061525 e: Ambient (20 °C)): 10000 n: 6UTB rs diluted to (mL): 20	0 °C) 2000.02	5E-05 B 0.058 F	2% 5E-05 Balance Uncertainty 0.058 Flask Uncertainty	2% 40.0 mty (mL)	Nitric Acid		Formulated By:		Giovanní Esposito	061522	য় য
Compound	Lot RM# : Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty Assay Purity (%) (%)	ay Target) Weight (g)	Actual Weight (g)	Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL) C	Solvent S CAS# 0S	SDS information (Solvent Safety Info. On Attached pg.) COHA PEL (TWA)	tion Attached pg.) LD50	NIST
1. Lead(II) nitrate (Pb)	IN029 PBD122016A1	10000	99,999	0.10 62.5	5 32.0006		10001.1		φ	0.05 ma/m3	introne	
[1] Speci	[1] Spectrum No.1 [17.284 s	90]:58	85.D#	17.284 sec]:58182.D# [Count] [Linear]	(upe						11
ສ ອ ອ												
7.2-> 2.0E6	20	O.		40	80	Co	20	Ö Ø	0	*	100	
1.0E6												
rn/z->	110	130		140	150	160	170	180		0	002	
ы С. С. Ш. С.												
R A E	210 220	530		N 0	250	260						
Part # 57182 Lot # 061522					1 of 2				Printed: 3	Printed: 3/16/2023, 1:45:32 PM	45:32 PM	

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



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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		d	000	14	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			1		:		2	10	10	70.02	*	ZULUS
_		đ	20.02	2		3	<0.02	q	<0.02	g	40.02	ŝ	<u>60.05</u>	Te	\$0.02	Ŋ	≤0.02
02 ₹07	` 	đ	<0.02	9	0.02	Mg	<0.01	ő	<0.02	4a	<0.02	Åø	2007	F	200	1	Ş
_	_	5	2007	1	200	1	000	i				9		17	70.02	>	70702
		3	70.70	4		UIW	20'02	P2	<0.02	2	40.02	Ra	5 9 9	đ	≤0.02	\$	20.02
	_	g	0.02	Ъ.	€02	Нg	<0.2	ρ.	2002	n d	2007	2	2007	e	000		
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							70.00	4	10	20	20.02	13		q	8.U2	3	808

Physical Characterization:

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

In P M.

Certified by:

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Part # 57182 Lot # 061522

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	, Inc.	¢			Certified	Reference	Certified Reference Material CRM	RM		2	2	ANAB ISO 17034 Accredited AR-1539 Certificate Number	4 Accredited
		5			M	SAD . I	(IRW	R Les/	101120	でい		https://Absolutestandards.com	andards.com
CERTIFIED WEIGHT REPORT: Part Number: Lot Number:	ber: ber:	<u>58111</u> 022123 Sodian (N	1		Solvent:	Lot # 21110221	Nitric Acid		F J	anna an	- China -	t t	
Expiration Date: 022126 Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (m1):	Date: "age: "mL): ther: w was dilute	022126 022126 Ambient (20 °C) 10000 6UTB 6UTB	and c) 2001 41	5E-05 D C	2% 5E-05 Balance Uncertainly	60.0 (mL)	Nitric Acid		Formulated By:	. \$	Lawrence Barry	022123	
Compound	RM#		Nominal Conc. (µg/mL)		raak uncertainty Assay Uncertainty Assay Purity (%) (%)	Target Weight (g)	Actual Weight (g) C	Actual Conc. (µg/mi.)	Expanded Uncertainty +/- (ug/mL)	(Solv CAS#	SDS Information ent Safety Info. On Attac OSHA PEL (TWA)	SDS Information Solvent Safety Info. On Attached pg.)	NIST
1. Sodium nitrate (Na)	1N036	IN036 NAV01201511	10000	666.66	0.10 26.9	111.5406	111.5410	10000.0	20.0	7631-99-4	5 mg/m3	ort-rat	3152a
5.0E倍	[1] Spectrum No.1		8.935	3:[Daa	8.935 sec]:58111.D# [Count] [Linear]	ount] [Lir	lear]					o b	
0 10 10 10 10 10 10 10 10 10 10 10 10 10					÷								
m/≥-> 5.0E6	9	30		0	9	O a	0	2	0	S	0.6	100	
С 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													
m/z->	011	120		000	140	150	160	170	p	180	190	80	
2.5E6													
<-z/ш	810 0	220		630	240	250	260						_
Part # 58111 Lot # 022123	123					1 of 2					Printed: 3/16/20	Printed: 3/16/2023, 1:45:29 PM	1

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

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):

	<0.02	B	<0.02	λ	≤0.02	Hf	<0.02	Ľ	<0.02	N	<0.02	놊	<0.02	3	€02	E.	4002	M	W W
Sb Sb	40.02	లో	<0.2	西	40.02	Н	40.02	2	<0.02	ź	<0.02	æ	<0.0>	3	0.02	4	40.02		2002
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	<0.02	ථ	<0.02	3	0.02	ч	<0.02	Ma	<0.02	Pd	<0.0>	R.	<0.02	e N	F-	Ē	200	\$	
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	\$0.02	8	<0.02	n¥.	40.02	2	40.02	PN	4002		40.2	3	200	s e		5 F		5 4	

Physical Characterization:

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

Certified by:

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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.

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

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	THE S
		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
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Part # 58119 Lot # 120822

1 of 2

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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				
4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	40,02 40,02 40,02 40,02 V 40,02 V V 60,02 V V 60,02 V V S Cr	ᅻᇟᆋᇽᇽᆇᇽ	4000 12 10 10 10 10 10 10 10 10 10 10 10 10 10	Ta Sr Na Sr Sr	44444 8888888888	Sch Rate Street	T 22 22 22 22 22 22 22 22 22 22 22 22 22	K J P Z Q J N	4 4 4 4 4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5	Mo Nd	4 4 4 4 4 4 4 8 8 8 8 8 8 8 8	월 27 월 4 월 8 표	888888888	<u>ት</u> ዓ ያ ያ ዋ ካ	40.02 40.020	58558 <u>5</u> 5	40.02 40.02 40.02 40.02 40.02 40.02 40.02	Al Sb Ba Be Bi Bi	
				[]	(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 ពេទ្ធ	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		
Ba 40.02	ନ ଜ	-T -T	ନ୍ଦ୍ର ହ	A 0.02	₹ ¹ =="	4. 6. B	H. Ma	A. A.	p Pd	A A 3 3	38	장	A A 3 3	ç N	A A 1	13	A.2	4 15		0.02 0		
		40.02	2 ଜ ା	40.02	363	4 4 A	N M ;	8 8 8	× 77 ·	A 40 12	រ ន រ	Sc Sm	40.02 2002	Ta s	4 4 A A	11 S 🔒						
								(T)=	(T)= Target analyte	anatyte												
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 a second		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	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	J	<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	H	<0.02	2	40.02

(T) = Target analyte

Physical Characterization:

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

in politic

Certifled by:

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

the preparation of all standards.

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

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

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

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		
	840 840		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		B	
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	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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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	M	M5768 [M5769 (64) Certified Reference Material	ce Material CRM	42/s	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description:	<u>58112</u> 091823 Magneslum (Mg)	Solvent: 24	Lot # 24002546 Nitric Acid	Advenue	Or -
Expiration Date: 091826 Recommended Storage: Ambient (Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	20 °C)		(mL) (mL) (BF) $R - \frac{1}{3}/2\phi$	Formulated By: Heviewed By:	Lawrence Barry 091823 Pedro L. Rentas 091823
Compound	Lot Nominal I RM# Number Conc. (µg/mL)	Purity Uncertainty Assay T (%) Purity (%) (%) We	Target Actual Actual Weight (g) Weight (g) Conc. (vg/mL)	Expanded Uncertainty +/- (µg/mL) CAS	SDS Information (Solvent Safety Info. On Attached pg.) NIST # OSHA PEL (TWA) LDSO SRM
1. Magnesium nitrate hexahydrate (Mg) IN030 маюзаал	10000	99.999 0.10 8.51 23		20.0 13446-1	ng/kg 3
[1] Spectrum No.1 1.0E6		[19.923 sec]:58112.D# [Count] [Linear]	[Linear]		
5. O M B R					
m/z-> 10	20	8	ø	70 80	90 100
1000 -		·		4	
₩/z->	120 130	140	150 160	170 180 1	190
1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0					
Part # 58112 Lot # 091823		-	1 of 2	Drintod	Drintod- 10/00/0000 0.56-15 DM

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		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):

Γ							Trace Mo	etals	Verifica	tion	by ICP-N	IS (µ	g/mL)						
									1100 100 100 100					100	The second second				
A	<0.02	8	<0.02	Dy	<0.02	Hf	<0.02	5	<0.02	Ni	<0.02	Ŗ	<0.02	Se	40.2	qI.	<0.02	W	<0.02
SP	<0.02	G	<0.2	E.	<0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	ŝ	<0.02	Te	<0.02	d	<0.02
As	<0.2	ĉ	<0.02	E	<0.02	In	<0.02	Mg]	SO	<0.02	Rh	<0.02	Ag	<0.02	H	<0.02	V	40.02
Ba	<0.02	S	<0.02	ନୁ	<0.02	F	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Ъ	<0.02	Υb	<0.02
Ве	<0.01	Ŷ	<0.02	Ga	<0.02	Fe	40.2	Hg	<0.2	٩	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	ĸ	<0.02
B	<0.02	S	<0.02	Ģ	<0.02	La	<0.02	Mo	<0.02	Ŗ	<0.02	Sm	<0.02	ŝ	<0.02	Sn	<0.02	6	<0.02
5	40.02	ç	40.02	Au	<0.02	P	<0.02	Nd	<0.02	ĸ	<0.2	S.	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 58112 Lot # 091823



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

Certified Reference Material CRM



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



							Trace M	letals	Verification	Ition	by ICP-MS		(ng/mL)							_
		and the second se	A CONTRACTOR OF A CONTRACTOR					All and the	The share of	The second s	ALL DESCRIPTION OF THE OWNER OF T	Nonese and			and the second second second				A COLUMN TO A C	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	ථ	<0.0≥	පී	<0.02	r.	<0.02	Mo	<0.02	đ,	40.02	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:

* 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 ($\frac{1}{4}$) 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 # 57050 Lot #	m/z->	N.01 M.4	m/2->-	1.0E5	171/2-> 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				
A)2 C C		2 2 2 2 2 2 2	40.02 Ni		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.				//
ŝ	9					mr P All
		:			20	
					÷	
 * 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 politoriated with using balances. 	centration calculat deionized water, ca ds. eticulously cleaned	d from gravimetric librated Class A gla prior to use.	and volumetric measurer ssware and the highest p	nents unless otherwise stated. writy raw materials are used in	ie stated. 'e used in	

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

Printed: 2/8/2024, 5:01:38 PM

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 (fru (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 2 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>

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

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	Te	€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
_	40.02	చి	≤0.02	ઝ	600	ы	<0.02	Mn	<0.02	P	40,02	ßb	<0.02	Na	40.2	đ	<0.02	Ŗ	<0.02
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_	<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 seo]: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

< 00 **N**



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:

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

Low P. S.

Certified by:

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

Part # 57033 Lot # 111323

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	m/z->	2500	m/z->	500	m/z->-	2.5 114	5.OE4	1. Ammonium dihydrogen phosphate (P)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	CERTIFIED WEIGHT REPORT: Par Lo De	www.absolutestandards.com
R I D 2 M 4 C 1 M 52 15 Interview Lat* Solvent: 2111021 Nitric Acid Provide (P) 2% 40.0 Nitric Acid 2000/2 0.058 Failure inventienty Environmenty 2000/2 0.058 Failure inventienty Environmenty Environmenty Nominia Party Uncertainty Assay Target Actual Actual Commutated By: Perford L Ren 10000 ease 0.10 27.5 72.7287 72.7287 72.7284 10000.0 30.0 772.78-1 5mg/r 12.074 aeoc)15891 15. D/r County (Linear) Ease Store 5mg/r 5mg/r 30 40 sio eo 70 sio sio sio sio 30 40 sio eo 70 sio sio sio sio 30 40 sio eo 70 sio sio sio 30 40 sio tio	N O		110		10		[1] Spectrum		-	Expiration Date: Recommended Storage: I Concentration (µg/mL): NIST Test Number: Weight shown below was d	DRT: Part Number: Lot Number: Description:	om
RICZINGLA MITELS Bolvent: 21110221 Nitric Acid IDP 2% 40.0 Nitric Acid SEC5 Balance locentary (mL) Nitric Acid Formulated Br. Formulated Br. SEC5 Balance locentary (mL) Nitric Acid Formulated Br. Lawrence Balance (mL) Formulated Br. Lawrence Balance (mL) Formulated Br. Lawrence Balance (mL) Source It Mitels Acid Formulated Br. Lawrence Balance (ML) Source It Mitels Acid Formulated Br. Lawrence Balance (ML) Source It Mitels Acid Formulated Br. Formulated Br	2220		120		N. O				Lot Number	041726 Ambient (20 10000 6UTB 6UTB	57115 041723 Phosphore	5
Hric Acid Iric Acid Iric Acid Iric Acid Iric Acid Actual Actual Actual Expanded Expanded Expanded SDS Inf Expanded SDS Inf Solvent Safety Inf eight (g) Conc. (ug/mL) · (AS# OSHA PEL) 2.7289 10000.0 20.0 7722-76-1 5 mg/m 2.7289 10000.0 20.0 7722-76-1 5 mg/m 150 170 180 190 190 190	230		130		ຜ. ວ		2.074 sec]:58			00.02	us (P)	R
Hric Acid Frite Acid Formulated By: Lawrence Ba Formulated By: Pedro L. Ren Expanded Actual Uncertainty (Solvent Safety Inf eight (g) Conc. (ug/mL) - 4/- (ug/mL) CAS# OSHA PEL 2.7289 10000.0 20.0 7722-76-1 5 mg/m 2.7289 10000.0 1722-76-1 5 mg/m 160 170 180 190 190	240		140		4		3115.D# [Cot		Uncertainty Assay Purity (%) (%)	2% Balance Uncertainty Flask Uncertainty	Solvent:	22/09/12
Formulated By: Lawrence Ba Formulated By: Lawrence Ba Reviewed By: Pedro L. Ren Conc. (ug/m), -/- (ug/m), CAS# OSHA PEL 10000.0 20.0 7722-76-1 5 mg/m 10000.0 20.0 7722-76-1 5 mg/m 10000.0 eio eio	250		150		S O		ınt] [Linear]					
Formulated By: Lawrence Ba Formulated By: Pedro L. Ren Expanded SDS Inf Uncertainty (Solvent Safety Inf +/- (ug/mL) CAS# OSHA PEL (20.0 7722-76-1 5 mg/m 20.0 7722-76-1 5 mg/m 20.0 190 90	260							2.7289 10000.	Actual Actual sight (g) Conc. (µg/1	rric Acid	tric Acid	15815
22-76-1 5 mg/m					1			20.0		Formulated B	Q	
o 200			4						SC (Solvent Saf CAS# OSH/	Ped	Gerence /	
.hed pg.) LbS0 LbS0									DS Information fety Info. On Attac A PEL (TWA)	L. Rentas	Jan	https://At
g 3186 SRM			9		J				0	041723 041723		tps://Absolutestandards.com

Abs	Absolute (800-368-1131 www.absolute	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	lards , ds.com	Inc.	-				ĉ	rtified Re	eren	Certified Reference Material CRM	ial CR	M					https AF	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	4 Accredited cate Number andards.com
-	nstrum	iental A	nalysi	s by Indi	uctive	ły Coupl	ed Pla	Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS);	s Spec	troscopy	(ICP	-MS):									
_								Trace Metals	etals	Verifica	Ition	Verification by ICP-MS	1.00	(µg/mL)							
-	A	40.02	8	40,02	Ą	40.02	H	40.02	E	A) ()2	Z	A)22	7	A).02	Se	A 2	ŧ	AB	W		
		A.22	5 2	A0.2	ម្មា	40.02	Но	40.02	Ŀ	40.02	NB	<0.02	Re	40.02	ŝ	40.02	Te	40.02	c :	40.02	
	Ba		<mark>ዮ</mark> የ	8 8 8 8	<u>ନ</u> ଜ	40.02 20	부 분	40.02 20	Mg	40.01 002	r S	A A 3 2	₽ ₽	A A 3 S	Å.	A) 02	1 11	A 600	\$ <	8 8	
		10.0>	ព្	<0.02	ណ្ឌ	<0.02	장	<0.2	Hg	40.2	שי	T	R Q	40.02	K 2	8.8 2		<0.02	4 'B	60.02 20.02	
	B	8 8 22 22	5 S	8 8 22 22	ନ ବ	40.02 20	32	4 4 A	N W	4 4 8 8	* 7	A0.02	s s	A A 3 S	, s	88	1 S	A A A A	2 B	88	
										(T)= Ta	(T)= Target analyte	alyte			ĺ						
hand	hysical	Physical Characterization:	cteriza	ution:														Cer	Certified by:	y:	
-	Iomogen	eity: No I	heteroge	neity was	observ	ed in the pr	eparati	Homogeneity: No heterogeneity was observed in the preparation of this standard.	ındard.								(h	J.	Ŵ	
* *	The cel Purified	rtified va l acids,	alue is 18.2 m	The certified value is the concen Purified acids, 18.2 megohm dei the menaration of all standards	centrat deioniz	tion calcul red water,	lated f	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 etandarde	metric s A gla	and volu	metric nd the	measure highest p	nents Jurity r	unless oth aw mater	nerwisc ials are	e stated. 9 used in					
* * * * *	All star Standa Standa All Star Uncerta Measur	ndard co rds are rds are ndards s ainty Re rement	ntaine prepare certife hould I ference Result,	rs are me ad gravin d (+/-) 0 es storec e: Taylor " NIST Te	eticulo netrica).5% o d with r, B.N. echnic	ally using the stat caps tigh and Kuya al Note 1;	hed pri balanc iced val it and it, C.E. 297, L	 * 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). 	e calit other ropriat nes for nment	brated wit wise stat te laborat Evaluatir Printing (h weig ed. ory co Office,)hts trace onditions. Expressir Washingt	able to og the l on, D.(to NIST (see above). e Uncertainty of NIST D.C. (1994).	e abov ty of N	e). IIST					
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Part #	57115		Lot # 041723	1723							2 of 2	of 2					Print	Printed: 2/8/2024, 5:01:22 PM	24, 5:0)1:22 PM	

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m/z->	N. 01 00	5. O M 8	m/z->	5.0E7	1.0E8	m/z->	N. 00 10 10	5.0E5	Ammonium sulfate (S)	Compound	NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	Part Number: Lot Number: Description:	800-368-1131 www.absolutestandards.com
210			110			10		[1] Spectrum No.1	IN117	RM#	umber: low was dilute	n Date: lorage: lg/mL):	<u>Part Number:</u> Lot Number: Description:	
220			120			NO		-	IN117 SLBR7225V	Lot Number C	GUTB d to (mL):	122926 Ambient (20 °C) 1000	<u>57016</u> 122923 Sulfur (S)	
230			130		2	30		33.603 80	1000	Nominal F Conc. (µg/mL)	4000.0 5	ĉ		<i>b</i>
N 40			140			b	den gegen og gener første kommen och som en forse og	33.603 sec]:57016.D# [Count] [Linear]	99.9 0.10 24.3	Purity Uncertainty Assay (%) Purity (%) (%)	5E-05 Balance Uncertainty 0.06 Flask Uncertainty		Solvent:	Certified Re
N 80			100			50		Count] [Lin	.3 16.4979	say Target 6) Weight (g)	Y		Lot # 122923	fere 12
N80			0			8		9 9 7	16.4980	Actual Weight (g)			ASTM Type 1 Water	aterial CRM
			170			70			1000.0	Actual (Conc. (µg/mL)	5		1	rm 167816-
			180			80			2.0 77	Expanded Uncertainty +/- (µg/mL)	Reviewed By:	M	Formulated By:	
						 Complete and complete 			7783-20-2	(Solvent : CAS# 05	Pedr	\$	a and a second sec	
			190			0			NA	SDS Information It Safety Info. On Attac OSHA PEL (TWA)	Pedro L. Rentas	e la	Benson Chan	http
			2000			100			ort-rat 4250mg/kg 3181	SDS Information (Solvent Safety Info. On Attached pg.) * OSHA PEL (TWA) LD50	122923	7	100002	AR-1539 Certificate Number https://Absolutestandards.com

1 of 2

Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).	 * All standard containers are meticulously cleaned prior to use. * All 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. * 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 	 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 measurement of all standards 		Homogeneity: No heterogeneity was observed in the preparation of this standard.	Physical Characterization:	(T) = Target analyte	AI A002 Cd A002 Pr A002 Pr	Trace Metals Verification by ICP-MS (µg/mL)	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
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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):

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

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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).

Part # 58030 Lot # 111623

Image:	TT/Z->	2500	5000	m/z->	500	 1000	N.00 M.4	5.0E4	1. Ammonium dihydrogen phosphate (P) IN008 PvœzoisAi	Compound	Weight shown below was diluted to (mL):	NIST Test Number:	Recommended Storage: Nominal Concentration (ug/mL):	Expiration Date:	Lot Number: Description:	CERTIFIED WEIGHT REPORT: Part Number:	www.absolutestandards.com
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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	М	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
Μ	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				
М	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	ĸ		0.130213	М	Rb		0.004575	Μ	TI		0.001266				
М	Co		0.000598	М	La	<	0.000300	М	Re	<	0.000300	Μ	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

Page 1 of 4

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$$\begin{split} \chi_{CRM,FRM} = & (\chi_{o}) \; (u_{char, o}) \\ \chi_{a} = mean of Assay Method A with ut and a charter of the standard uncertainty of uncertainty of the standard uncertainty$$

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

Certified Value, X_{CRMMM}, where two or more methods of characterization are used is the weighted mean of the results: Characterization of CRM/RM by One Method Characterization of CRM/RM by Two or More Methods

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent to following equations are used in the calculate/K=2.

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

ICP Assay NIST SRM 3162a Lot Number: 130925 1002 ± 4 hg/mL

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:noiternotnl ysseA

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

 $\chi_q = mean of Assay Method I with standard uncertainty updat 1$ w₁ = the weighting factors for each method calculated using the the transmission of the standard s

CERTIFIED VALUES AND UNCERTAINTIES 3.0

Starting Material Purity: 99.9975% Starting Material Lot#: 2094 Starting Material: In Metal unineti l 1 000 hg/mL ea: :(s)ətylanA \ əulsV :xinteM

tr. HF 2% (v/v) HNO3 27991717-2T Lot Number: **LITED** Catalog Number: Product Code:

Single Analyte Custom Grade Solution

PRODUCT DESCRIPTION 0.S

Number QSR-1034).

the Competence of Reference Material Producers" and ISO/IEC 17025, "Ceneral Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Vantures is also an ISO 9001 registered manufacturer (QSR Certificate Inorganic Practices is also an ISO 9001 registered manufacturer (CSR Certificate INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for



ACCREDITATION / REGISTRATION 0.r

300 Technology Drive Christiansburg, VA 24073 USA Christiansburg, VA 24073

R:2/22/24

info@inorganicventures.com E: 240-282-3015 E: 240-282-3030

Refine your results. Redefine your industry. Certificate of Analysis 6LESH' 8LESH

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

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)

.my €.0 a2 M 0732£0.0 > ⊨N O 832000.0 > ⊔∃ M 8€2000.0 > ⊵A M ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to CRMRMs 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 up of the method for each element of the property effection of the method for the met

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

- For the calibration of analytical instruments and validation of analytical methods as appropriate. 9.0 INTENDED USE

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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Page 3 of 4

- Chemical Testing - Accredited / A2LA Certificate Number 883.01 "serveter of the second sec

- QSR Certificate Number QSR-1034

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Homogeneity data indicate that the end user should take a minimum server of 0.2 m L or 2.0 m L or 2 - This solution was more according to the superior superior of the form as the solution of the homogeneous. المستحدم المرابعة الم .viienegeneity.

Please refer to the Safety Data Sheet for information regarding this CRMRM. HOMOGENEITY 0'6

NOITAMAORNI SUOGAASAH 0.8

1401150180, 14011702, 36Ar12C, 48Cs, 196X≃2 (Where X = Zr, Mo, Fu) Ωb, Ta, Cr, U	.sselo n r r r	0.0054 / 0.00052 µg/mL 0.0054 / 0.00038 µg/mL 0.0053 / 0.00034 µg/mL 10 not be prepared or stored ir 10N	CP-OES 323.452 nm (CP-OES 334.941 nm (CP-OES 334.941 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm (CP-OES 336.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm) (CP-OES 34.121 nm)
SET Interferences (underlined indicates severe) 32S160, 32S14N,	Orde A/N	14 pt	ICP-MS 48 amu

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

1:1:1 H2O / HF / H2SO4 or fuse ash with pyrosultate it oxide is as plastic pigment and likely in prookite Notentity: Oxde - low temperature history and sortanty - ineer (sortant in 122) in source heads Notentity: Oxde - low temperature history (-800EC) brookite (fuse in Pto with KS2207); Ores (f TI Containing Samples (Preparation and Solution) - Metal (Soluble in H2O / HF caution -powder reacts violentino: Ovide , Iour Inergene , or entile (Discoluted by Inergene) and Ferdinal Market (Soluble In 1997).

HINO3 / LORE OFFICE ONDER (10,000 ppm single element solutions as the TI(F)6-2 chemically stable for years in HNO3 / totalenet (an LDPE containet. 2-5% HNO3 / totalenet (an LDPE containet. TI Containing Samples (Prenaration and Solution) - Metal (Solution in 200 / LE containe and tot years) with a fendency to hydrolyze forming the hydrafied 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 point and element solutions as the Ti(F)6-2 chemically stable for year media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of thansition elements unless they are fluorinated). Stable with more inorganic anions with a tendency to hydrolyze forming the hydrafed oxide in all dilute acids except HF. Chemical Compatibility - Soluble in concentrated HCI, HF, H3PO4 H2SO4 and HVO3. Avoid neutral to basic S-8(T)T 6 4+ 78.74 - noiluite in Solution (Chemical Form in Solution - 47.74 6 T(F)6-5-- For more information, visit www.inorganicventures.com/TCT Afomic Weinher Valence: Coordination Winnher: Chemical Equa

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

Page some more served to the served to the served to the organization of the concentration(s). It is be the responsibility of the user to account for this effect. When the bottle is weighed both before and after being the responsibility of the user to account for this effect. When the bottle is weighed both before and after being the rescaled to the test to account for this effect. When the bottle is weighed both before and after being the rescaled to the test to account for this effect. When the bottle is weighed both before and after being the rescaled to the test to account for this effect. When the bottle is the active the bottle is the rescaled to the test to account for the test to account to the test to account the test to account to test to account to account to the test to test to acc - While stored in the sealed TCT bag, transpiration of this CRAWRM is negligible. After opening the sealed TCT had transmission of the CDMMAN will occur recutification increase in the source opening monocarterization of the

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

Page 4 of 4

Certifying Officer:

Chairman / Senior Technical Director

201928

Paul Gaines

-

Thomas Kozikowski Manager, Quality Control

Certificate Approved By:

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NAMES AND SIGNATURES OF CERTIFYING OFFICERS

- 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.

- Sealed TCT Bag Open Date:

11.3 Period of Validity stability studies conducted on property stored and handled CR/WRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

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

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

- June 17, 2027

11.2 Lot Expiration Date

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

June 17, 2022

11.1 Certification Issue Date

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY 0.11

norganic Ventures, 300 Technicky Drive, Christianeburg, Ve. 24073, USA; Telephone: 800,669,678; 540,585,3030, Fax: 540,562,5015; Innegan

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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
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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.
 - All standard containers are meticulously cleaned prior to use.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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Certified Reference Material CRM



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

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.

Certified by:

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

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Lot # 071423 Part # 57040



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com R: 2/22/2024 M5999

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution	
Catalog Number:	CLPP-SPK-1	
Lot Number:	T2-MEB721963	
Matrix:	7% (v/v) HNO3	
Value / Analyte(s):	2 000 µg/mL ea: Aluminum,	Barium,
	1 000 µg/mL ea: Iron,	
	500 μg/mL ea: Manganese, Vanadium, Cobalt,	Nickel, Zinc,
	250 µg/mL ea: Copper,	
	200 μg/mL ea: Chromium,	
	50 µg/mL ea: Beryllium,	Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Aluminum, Al	CERTIFIED VALUE 2 000 ± 7 µg/mL	ANALYTE Barium, Ba	CERTIFIED VALUE 2 000 ± 9 µg/mL
Beryllium, Be	50.00 ± 0.26 µg/mL	Chromium, Cr	200.0 ± 1.1 µg/mL
Cobalt, Co	500.0 ± 2.4 μg/mL	Copper, Cu	250.0 ± 1.0 µg/mL
Iron, Fe	1 000 ± 4 µg/mL	Manganese, Mn	500.0 ± 2.0 µg/mL
Nickel, Ni	500.0 ± 2.2 μg/mL	Silver, Ag	50.00 ± 0.22 µg/mL
Vanadium, V	500.0 ± 2.2 μg/mL	Zinc, Zn	500.0 ± 2.2 μg/mL

1.070 g/mL (measured at 20 ± 4 °C)

Assay Information:

Density:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
A!	ICP Assay	3101a	140903
Al	EDTA	928	928
Ba	ICP Assay	3104a	140909
Ba	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
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
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
V	IC Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928

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

Characterization of CRM/RM by Two or More Methods 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 Ass	ay Method i with standard uncertainty uchar i
	g factors for each method calculated using the inverse square of
the variance	

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

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k \left(u^2_{char} + u^2_{bb} + u^2_{15} + u^2_{15} \right)^{\gamma_2}$ k = coverage factor = 2

 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$ where u_{char} are the errors from each characterization method ubb = bottle to bottle homogeneity standard uncertainty unts = 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_{CRM/RM}, where one method of characterization is used is the mean of individual results:

X_{CRM/RM} = (X_a) (u_{char a}) Xa = mean of Assay Method A with uchar a = the standard uncertainty of characterization Method A

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.869.8799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

Page 3 of 4

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

11.1 Certification Issue Date

July 27, 2022

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

11.2 Lot Expiration Date

- July 27, 2027

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

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

11.3 Period of Validity

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

SD9781.

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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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 $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

11.1 Certification Issue Date

June 21, 2023

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

11.2 Lot Expiration Date

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

- 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

Hydrochloric Acid, 36.5-38.0% BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis





R->10/13/24

Met dig

Material No.: 9530-33 Batch No.: 0000275677 Manufactured Date: 2020/12/16 Retest Date: 2025/12/15

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Certificate of Analysis

Test	Specification	Result
ACS - Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6
ACS – Color (APHA)	<= 10	5
ACS – Residue after Ignition	<= 3 ppm	1
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.190
ACS – Bromide (Br)	<= 0.005 %	< 0.005
ACS – Extractable Organic Substances	<= 5 ppm	1
ACS - Free Chlorine (as Cl2)	<= 0.5 ppm	< 0.5
Phosphate (PO4)	<= 0.05 ppm	< 0.03
Sulfate (SO4)	<= 0.5 ppm	< 0.3
Sulfite (SO3)	<= 0.8 ppm	0.3
Ammonium (NH4)	<= 3 ppm	< 1
Trace Impurities - Arsenic (As)	<= 0.010 ppm	< 0.003
Trace Impurities - Aluminum (Al)	<= 10.0 ppb	< 0.2
Arsenic and Antimony (as As)	<= 5 ppb	< 3
Trace Impurities – Barium (Ba)	<= 1.0 ppb	< 0.2
Trace Impurities – Beryllium (Be)	<= 1.0 ppb	< 0.2
Trace Impurities – Bismuth (Bi)	<= 10.0 ppb	< 1.0
Trace Impurities – Boron (B)	<= 20.0 ppb	< 5.0
Trace Impurities - Cadmium (Cd)	<= 1.0 ppb	< 0.3
Trace Impurities – Calcium (Ca)	<= 50.0 ppb	29.7
Trace Impurities – Chromium (Cr)	<= 1.0 ppb	< 0.4
Trace Impurities – Cobalt (Co)	<= 1.0 ppb	< 0.3
Trace Impurities – Copper (Cu)	<= 1.0 ppb	< 0.1
Trace Impurities – Gallium (Ga)	<= 1.0 ppb	< 0.2

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

Material No.: 9530-33 Batch No.: 0000275677

Test	Specification	Result
Trace Impurities – Germanium (Ge)	<= 3.0 ppb	< 2.0
Trace Impurities – Gold (Au)	<= 4.0 ppb	< 0.2
Heavy Metals (as Pb)	<= 100 ppb	< 50
Trace Impurities – Iron (Fe)	<= 15.0 ppb	<]
Trace Impurities – Lead (Pb)	<pre>>> dqq 0.1 =></pre>	< 0.5
Trace Impurities – Lithium (Li)	<= 1.0 ppb	0.2
Frace Impurities – Magnesium (Mg)	<= 10.0 ppb	0.2
Frace Impurities – Manganese (Mn)	<= 1.0 ppb	< 0.4
race Impurities – Mercury (Hg)	<= 0.5 ppb	0.1
race Impurities – Molybdenum (Mo)	<= 10.0 ppb	< 5.0
race Impurities – Nickel (Ni)	<= 4.0 ppb	< 0.3
race Impurities – Niobium (Nb)	<= 1.0 ppb	< 0.2
race Impurities – Potassium (K)	<= 9.0 ppb	< 2.0
race Impurities - Selenium (Se), For Information Only	ppb	1.0
race Impurities - Silicon (Si)	<= 100.0 ppb	< 10.0
race Impurities – Silver (Ag)	<= 1.0 ppb	< 0.3
race Impurities – Sodium (Na)	<= 100.0 ppb	< 5.0
race Impurities – Strontium (Sr)	<= 1.0 ppb	< 0.2
race Impurities – Tantalum (Ta)	<= 1.0 ppb	< 0.2
ace Impurities - Thallium (TI)	<= 5.0 ppb	
ace Impurities – Tin (Sn)	<= 5.0 ppb	< 2.0
ace Impurities - Titanium (Ti)	<= 1.0 ppb	< 0.8
ace Impurities – Vanadium (V)	<= 1.0 ppb	0.2
ace Impurities – Zinc (Zn)	<= 5.0 ppb	< 0.2
ace Impurities – Zirconium (Zr)	<= 1.0 ppb	0.3 < 0.1

For Laboratory, Research or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications

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

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





R-> 11/12/24 TH6126

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

Certificate of Analysis

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

>>> Continued on page 2 >>>

Nitric Acid 69% CMOS





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

Test	Specification	Result	

For Microelectronic Use

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



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)
1. Magnesium nitrate hexahydrate (Mg) IN030 Mgposzoza41	10000 98.999 0.10 8.51 234.9183 234.9459	20.0 13446-18-9 NA orf-rat
[1] Spectrum No.1 1.0E6	[19.923 sec];58112.D# [Count] [Linear]	
g. Oeg		
m/≈-> 10 2000	20 30 40 50 6 0	70 80 90 100
1000		
m/z-> 110 2.0厘4	120 130 140 150 160	170 180 190 200
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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		3	;	3	3 3	5	a g	10.02	1	0.02	1	<0.02	F	20.02	HI	20.02	Ŋ	<0.02	2	<0.02	A
		4	W	40.02	7	c (b)	S	300	Dr	3		2003	1	200							

(I) = larget analyte

Physical Characterization:

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

Son P. A.

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 # 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.
	N N O		120		0 0			A1		õ	58025 101124 Manganese (Mn)	
	N. 0		100		۵ Ö		[34.243 sec]:57025.D# [Count] [Linear]	1000 99.999	4000.2 0.10 Fit Nominal Purity U Cone. (ug/mL) (%) F	Ś	R-71/13/2& Solvent:	Се
_	N 4 0		140		4 0		25.D# [Count]	0.10 20.8	0.10 Flask Uncertainty Purity Uncertainty Assay (%) Purity (%) (%)	SE-05 Balance Uncertainty		rtified Referen
1 of 2	260 260		150 160		0. 0.		[Linear]		Target Actual Weight (g) Weight (g)	(mL) Nitric Acid	46	Certified Reference Material CRM
			170		70				Actual Conc. (ug/mL)	(M
Prin			180		8			2.0 15710-66-4	Expanded Uncertainty (SolVe +/- (µg/mL) CAS#	Pormulated by:	Giovannie	
Printed: 1/10/2025, 4:51:16 PM			190		80			5 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.) S# OSHA PEL (TWA) LD50	Pedro L. Rentas	Especite	ANA AR- https:
:51:16 PM			N 0 0		100			orl-rat >300mg/kg	ttion Attached pg.) LD50	101124		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
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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



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	and a street	ICV6-0400
Element	Concentration (µg/L) (after 100-fold dilution)	Analyte	Concentration (µg/L) (after 100-fold dilution)
Hg	4.0	CN-	99

_				/			1. Sodium nitrate (Na)	Compound	Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	CERTIFIED WEIGHT REPORT: Part Numbei Lot Numbei	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
m/z->	N 0 11 0	m/z-≻ 5.0E6	N.5 6	m/z-> 5.0∈6	2.5E5	5.0E5	trate (Na)	đ	Description: Sodium (Expiration Date: 12226 Recommended Storage: Ambient (2 I Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was dliuted to (mL):	<u>VEIGHT RE</u> Part I Lot I	standards.c
						[1] Spec	=		Description: Expiration Date: nended Storage: ntration (µg/mL): htration (µg/mL): T Test Number: ST Test Number:	HT REPORT: Part Number: Lot Number:	om
0		110		10		[1] Spectrum No.1	IN036 NAV01201511	Lot RM# Number	Sodiur 12226 Ambien 10000 6UTB 6UTB	<u>58111</u> 122223	
N N O		120		N. O		-				23	V
230		130		а О			10000 99.999	Nominal Purity Conc. (µg/mL) (%)	5) 3000.4 0.06		Rin
		and here and				8.935 sec]:58111.D# [Count] [Linear]	999 0.10	ity Uncertainty) Purity (%)	2% 5E-05 Balance Uncertainty 0.06 Flask Uncertainty		Certi
240		140		6		.D# [Cot	26.9	Assay (%)	2% ncertainty ertainty	Solvent:	ified Refu
N U O		150		Ö		unt) [Line	111.5406	Target Weight (g)	60.0 (mL)	Lot # 24002546	erence Mi MSR 0
280		160		0 O		ar]	111.5479	Actual Weight (g)	Nitric Acid	Nitric Acid	Certified Reference Material CRM 5 124 MSR06 MS
				N			10000.7	Actual Conc. (µg/mL)		3	RM 5807
		170		70			20.0	Expanded Uncertainty +/- (µg/mL)	Formulated By:	Allea	
		180		80			7631-99-4	0	By:	aha	
		190		80			5 mg/m3	SUS information (Solvent Safety Info. On Attached pg.) AS# OSHA PEL (TWA) LD50	Aleah O'Brady	Brad	×
		200		100				SUS Information afety Info. On Atta OSHA PEL (TWA)	ady C	All I	ANAB AR-1 https:///
		ŏ		ŏ			orl-rat 3430 mg/kg	ached pg.) سەءە	122223		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
							9/kg 3152a	NIST	223		4 Accred cate Num andards.c

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Printed: 12/29/2023 2:56:20 PM	Printed: 12/2					2 of 2							2223	Lot # 122223		# 58111	Part #
	r sed in	The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory conditions. Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).	nts unless oth ity raw materi e to NIST (see the Uncertaint , D.C. (1994).	ements purity ; eable to ing the gton, D.	The certified value is the concentration calculated from gravimetric and volumetric measureme Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest puri 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 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 t Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington,	and the and the ith weig ated. atory co atory co flice,	The certified value is the concentration calculated from gravimetric and volume Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the preparation of all standards. All standard containers are meticulously cleaned prior to use. Standards are prepared gravimetrically using balances that are calibrated with w Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated. All Standards should be stored with caps tight and under appropriate laboratory Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating a Measurement Result," NIST Technical Note 1297, U.S. Government Printing Offi	avimetri ass A g are cali are cali ppropria ernmen	from gra rated Cl ior to us ces that lue, unle under a J.S. Gov	ulated er, calib er, calib er, calib er, calib g baland g baland g baland ght and ght and 1297, L	tion calc zed wat ally usin ally usin of the st and Ku al Note	ncentra ards. meticule 0.5% c 0.5% c lor, B.N Technic	The certified value is the concentration calculated from gravi Purified acids, 18.2 megohm deionized water, calibrated Clas the preparation of all standards. All standard containers are meticulously cleaned prior to use. 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. Gover	value i s, 18.2 ion of e prepa e certifi e certifi Referen it Result	certified preparat preparat dards ar dards ar dards ar tandards suremen	* The * Purif * All s * Stan Mea:	
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Certificate of Analysis M5738 M&739 M5740 MS741 M5742 Refine your results. Redefine your industry.

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M5743

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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 Soluti	on
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 _{CRMRM} , 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	

	1.4	э	CEI	unea	Moundance	
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.		VALUES" FOF 303, AND ICSA				MS
Element	CRQL	Part A (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)	Part A +Part B (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)
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

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

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Page 1 of 2



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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)

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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

	1.057	2.0年7	m/z->	р. С. С. С.	5.0 E	7/2->	N 0 0	5.0E5	1. Antimony (Sb)	Compound	Volume shown below was diluted to (mL):	NIST Test Number:	Recommended Storage: Nominal Concentration (µg/mL):	Expiration Date:	Part Number: Lot Number: Description:	CERTIFIED WEIGHT REPORT:	800-368-1131 www.absolutestandards.com
)			110			10		[1] Spectrum No.1	58151	Part Number	lip sam mo	ber	nL):	ate:	on:		
			12.			NO		40.1	1 100923	Lot r Number	uted to (mL)	6UTB	Ambient (20 °C) 1000	120526	57051 120523 Antimony (Sb)		
									0.1000	Dilution Factor	: 3000.41		20 °C)		w (Sb)		Ri
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:			140			\$ 0		051.D#	0.084	Uncertainty) Pipette (mL)		Balance Uncertainty				ł	Certified
			1 80			50		17.964 sec]:58051.D# [Count] [Línear]	1000	Nominal	unty	rteintv		2.0%	24002546	Lot #	Certified Reference Material CRM (芝り MS802 Mら
-						Ö		_(near]	10001.4	Initial) Conc. (µg/ml				(mL)	Nitric Acid	Solvent:	nce Material
			180			80			1000.0	Final nL) Conc. (µg/mL)				Nitric Acid			CRM
			170			70			0 2.1	Expanded Uncertainty mL) +/- (µg/mL)		Reviews	K	id Formulated By:			UU UU
			180			80			7440-36-0	Ĕ	an of		20	ited By:	Ferre		
			190			0				Solvent Sa CAS# OSH/		Pertr	the second	Lawr	and b		V
						A. and A. and A. and A.			0.5 mg/m3	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		o I Rentas	SA)	Lawrence Barry	De		Alv AR https
			200			100			orl-rat 7000 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50							ANAB ISO 1:/034 Accreated AR-1539 Certificate Number https://Absolutestandards.com
) mg/kg 3102a) NIST	120020	120523		120523			tificate l standar

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):

							I race M	etals	Verifica	tion	by ICP-N	IS (II)	g/mL)						
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				I					NAL ON	ļ	44	Ŕ	20.02	12	20.02	11	40.02	2	20.02

(T) = Target analyte

Physical Characterization:

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

Certified by:

In P. S.

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

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

the preparation of all standards.

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

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

Part # 57051 Lot # 120523

N 55 10 0	m/z-> 110 5.0E6	រា .0 ៣ ភា	m/≥-> 10	ហ .0 ព	[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

1 of 2

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

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			The shares of	A COLUMN	Contraction of the	State of	UNIX 2 COL	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	<0.02	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
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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:

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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.

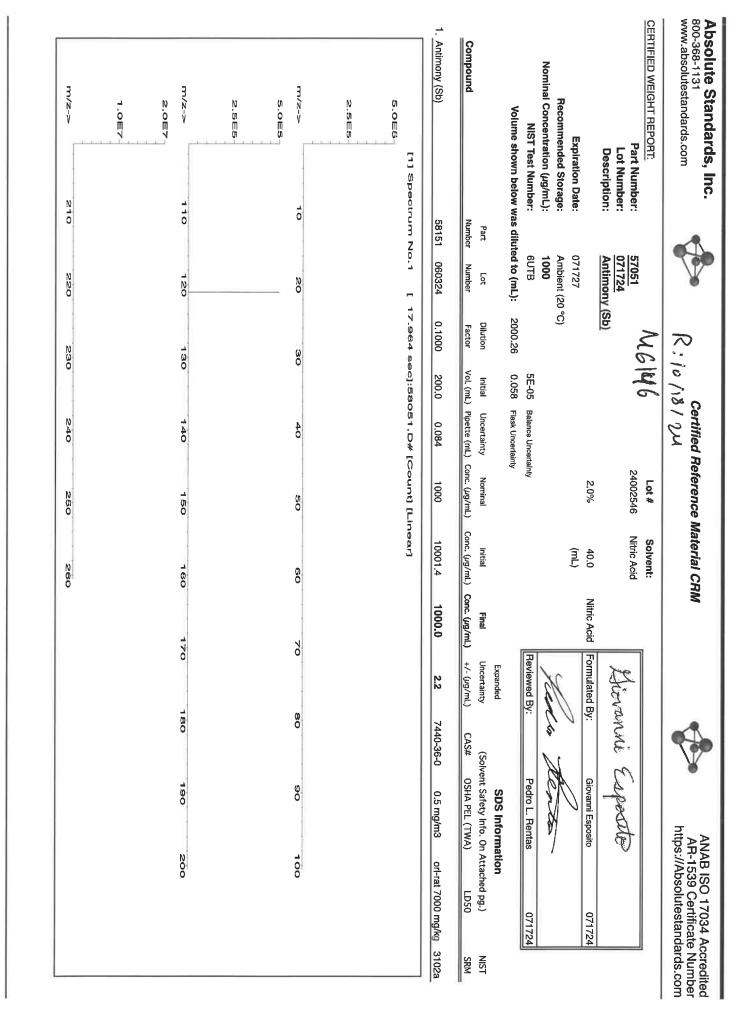
the preparation of all standards.

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

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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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Ta	s	Sr	Na	Ag	Si	Se		
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T	Sn	Tm	Τħ	T	Te	Τb		
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Zr	Zn	Y	Υь	V	Ч	W		
<0.02	<0.02	<0.02	<0.02	<0,02	<0.02	<0.02		

(T) = Target analyte

Physical Characterization:

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

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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- * 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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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 u_{char 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.

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

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

6.0 INTENDED USE

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

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

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160 170 180 190 200	150 10	0 140	120 130	m/z-> 110
				5. 0 E 5
60 70 80 90 100	50	40	20 30	m/z-> 10
				N.5E6
	unt] [Linear]	14.495 sec]:58138.D# [Count] [Linear]	_	[1] Speatrum No.1 5.0E6
10000.1 20.0 10042-76-9 NA orf-rat >2000mg/kg 3		99.997 0.10	7 SRZ022018A1	trate (Sr)
Expanded SDS Information Actual Actual Uncertainty (Solvent Safety Info. On Attached pg.) NIST Weight (g) Conc. (ug/mL) +/- (ug/mL) CAS# OSHA PEL (TWA) LD50 SRM	Target Weight (g)		Lot Nominal RM# Number Conc. (µg/mL)	Compound
Reviewed By: Pedro L. Rentas 082922		5E-05 Balance Uncertainty 0.058 Flask Uncertainty	6018 diluted to (mL): 1000.12	Weight shown below was diluted to (mL):
Nuic Acid Formulated by: Lawrence barry 082922	(mL)	6 1	082925 Ambient (20 °C) 10000	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):
Advance Bary	20510011	Solvent:	<u>56138</u> <u>082922</u> <u>Strontium (Sr)</u>	Part Number: Lot Number: Description:
I CRM ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Certified Reference Material CRM いままのション	Certified Ref এ৯।।১।২३ শ	R:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT:

vww.absolutestandards.com	300-368-1131	\bsolute Standards,
		Inc



Certified Reference Material CRM



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

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					10-31										10 T		101000		No. of Concession, No. of Conces
AI	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Ε.	<0.02	<u>N</u>	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
SР	<0.02	Ca	<0.2	막	<0.02	Но	<0.02	Lu	<0.02	ß	<0.02	Re	<0.02	ŝ	<0.02	Te	A0.02	ď	<0.02
As	<0.2	ĉ	<0.02	F	<0.02	ľ	<0.02	Mg	<0.01	õ	<0.02	Rh	<0.02	Ag	<0.02	Ц	<0.02	<	<0.02
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Be	<0.01	Ω	<0.02	Ga	<0.02	F	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	Ţ	Tm	<0.02	Y	<0.02
Bi	<0.02	ĉ	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Ŗ	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	<0.02
в	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	ĸ	<0.2	Sc	<0.02	Ta	<0.02	H	<0.02	Zr	<0.02

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

(T)= Target analyte

Physical Characterization:

Certified by:

Sur & Sur

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

the preparation of all standards.

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

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

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

Part # 56138 Lot # 082922

2 of 2

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->
	E	Part Number: Lot Number: Description:	Expiration Date: nended Storage:	NIST Test Number:	Weight shown below was diluted to (mL):		VIMH.	[1] Spectrum No.1			10			110			012
		<u>57081</u> 062724 Thalllum (TI)	062727 Ambient (20 °C)	6UTB	ed to (mL):	Lot	Number	-			N			120			220
			°C)	58	2000.1 0	Nominal Pi	Conc. (J/g/mL)	14.044 sec			a O			130			230
Certified Refi R ! 8]5]24		Š		5E-05 Balance Uncertainty	0.10 Flask Uncertainty	Purity Uncertainty Assay	(%) PUTTY (%)	14.044 sec]:57081.D# [Count] [Linear]			4. 0			140			240
Certified Reference Material CRM とという		Solvent: 2400	2% 40 (m	pertainty	ainty	y Assay Target	(%) Weight (g)	₩ [Count] [Li			01			150			250
e Material		24002546 Nitric Acid	40.0 Nitric Acid (mL)			get Actual		[Linear]									
СRМ М6023		loid	cid			Actual	Weight (g) Conc. (µg/mL)				8			160			260
23		Alea	Formulated By:	Reviewed By:		Expanded Uncertainty	L) +/- (µg/mL)				70			170			
		20	8			(Solvent	CAS#				80			180			
http		Grandly	Aleah O'Brady	Pedro L. Rentas		SDS Information Safety Info. On Atta	OSHA PEL (TWA)				8			190			
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com			062724	062724		SDS Information (Solvent Safety Info. On Attached pg.)	DSG1				100			200			
Accredite te Numbe dards.con	٤		4	4	l	NIST	SKM										

Part # 57081 Lot # 062724

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





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

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

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(I) = Target analyte

Physical Characterization:

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

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

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

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT:	Part Number: 57023 Lot Number: 062424 Description: Vanadium (V)	Expiration Date: 062427			Volume shown below was diluted to (mL): 2000.3	Part Lot Dilution	Compound Number Number Factor	1. Ammonium metavanadate (V) 58123 021224 0.1000	[1] Spectrum No.1 [34.243 2.0E6		m/z->- 10 20	2.067	1.067	m/z 110 120 1	2.588	
8:81 Ce					5E-05	0.06	Initial		200.0	sec]:58		30			190		200
Certified Reference Material CRM 冬」 シート					Balance Uncertainty	Flask Uncertainty	Uncertainty		0.084	34.243 sec]:58023.D# [Count] [Linear]		4			140		240
eference l	Lot #	24002546	2,0%		inty		Nominal	Conc. (µg/mL)	1000	žount) [Lin		5 0			- 50		2000
Naterial Cl	Solvent:	Nitric Acid	40.0 (mL)				Initial	Conc. (µg/mL)	10000.3	1⊖ar]		60			160		260
MF M6021			Nitric Acid				Final	Con	1000.0						- 		•
21		Alla	Formulated By:	M	Reviewed By:		Expanded		2.2			70			170		
		Alleah & Brack	J By:	2 l	y:		(Solve)		7803-55-6			80			180 0		
ht		Garan	Aleah O'Brady	ento	Pedro L. Rentas		SDS Information It Safety Info. On Atta	OSHA PEL (TWA)	0.05 mg/m3			90			190		
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com			062424	/	s 062424		SDS Information (Solvent Safety Info. On Attached pg.)	(A) LD50	3 ort-rat 58.1mg/kg			100			200		
Accreditec te Numbe dards.con	1		<u> </u>			ļ	NIST	SRM	3165								

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Lot # 062424

Part # 57023





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. Sur

Certified by:

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