

Prep Standard - Chemical Standard Summary

Order ID :	Q1478
Test :	TCLP ICP Metals, TCLP Mercury
Prepbatch ID :	PB166990,PB167014,
Sequence ID/Qc Bate	ch ID: LB134924,LB134965,LB134965,

Standard ID :

MP84563,MP84564,MP84565,MP84566,MP84636,MP84637,MP84638,MP84639,MP84640,MP84641,MP84642,MP84642,MP84644,MP84644,MP84646,MP84649,MP84650,MP84720,MP84721,MP84759,MP84766,MP84768,MP84770,MP84776,MP84777,MP84778,MP84778,MP84779,MP84780,MP84781,MP84782,MP84783,MP84784,MP84785,MP84786,MP84787,MP84788,MP84790,

Chemical ID :

M4371,M4465,M4884,M4916,M5062,M5192,M5218,M5288,M5296,M5395,M5429,M5467,M5472,M5496,M5497,M5532 ,M5658,M5747,M5748,M5751,M5789,M5792,M5798,M5799,M5800,M5801,M5811,M5814,M5815,M5816,M5817,M5820 ,M5875,M5882,M5884,M5959,M5962,M5970,M5978,M5985,M6003,M6011,M6021,M6023,M6028,M6030,M6032,M6041 ,M6077,M6126,M6127,M6128,M6144,M6145,M6146,M6150,M6151,M6152,M6155,W 3112,



Recipe ID 3965	NAME 2:1 H2SO4 : HNO3	<u>NO.</u> MP84563	Prep Date 02/18/2025	Expiration Date 06/03/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipetteID None	Supervised By Janvi Patel 02/19/2025
<u>FROM</u>	1600.00000ml of M6041 + 800.0000	Dml of M612	6 = Final Qua	antity: 3200.000	D 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>	Supervised By
65	POTASSIUM PERMANGANATE SOLUTION 5%	<u>MP84564</u>	02/18/2025	08/18/2025	Mohan Bera	None	None	Janvi Patel 02/19/2025
FROM	100.00000gram of M4916 + 2000.00	000ml of W	3112 = Final (Quantity: 2000.	000 ml			



Recipe ID 66	NAME POTASSIUM PERSULFATE SOLUTION 5 %	<u>NO.</u> MP84565	Prep Date 02/18/2025	Expiration Date 08/06/2025	Prepared By Mohan Bera	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	Supervised By Janvi Patel 02/19/2025
FROM	100.00000ml of M4465 + 2000.0000	Dml of W311	2 = Final Qu	antity: 2000.000	D 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> Janvi Patel
67	SODIUM CHLORIDE - HYDROXYL- CHLORIDE	<u>MP84566</u>	02/18/2025	06/25/2025		METALS_SCA LE_3 (M SC-3)		02/19/2025
FROM	SOLUTION 2000.00000ml of W3112 + 240.0000	Ogram of M4	1371 + 240.00	000gram of Mt	5884 = Final Qu	uantity: 2000.000) ml	



Recipe ID 902 FROM	NAME ICP AES CAL BLK (SO/ICB/CCB) 125.00000ml of M5792 + 2350.00000	<u>NO.</u> <u>MP84636</u> Oml of W311	Prep Date 02/25/2025 2 + 25.00000	Expiration Date 03/25/2025 ml of M5789 =	Prepared By Kareem Khairalla Final Quantity:	ScaleID None 2500.000 ml	PipettelD None	Sarabjit Jaswal 02/28/2025
Recipe ID 907 FROM	NAME ICP AES STD S (S5) 5.00000ml of M5395 + 5.00000ml of	<u>NO.</u> <u>MP84637</u>	Prep Date 02/25/2025	Expiration Date 03/25/2025	Prepared By Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal

M 5.00000ml of M5395 + 5.00000ml of M5970 + 5.00000ml of M6077 + 5.00000ml of M6146 + 455.00000ml of MP84636 = Final Quantity: 500.000 ml



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Recipe ID 910	NAME ICP AES STD S4	<u>NO.</u> MP84638	Prep Date 02/25/2025	Expiration Date 03/25/2025	<u>Prepared</u> <u>By</u> Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	50.00000ml of MP84636 + 50.00000	ml of MP846	537 = Final Q	uantity: 100.00	0 ml			

Recipe				Expiration	Prepared		D: (()D	Supervised By
ID	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
909	ICP AES STD S3	<u>MP84639</u>	02/25/2025	03/25/2025	Kareem	None	None	
					Khairalla			02/28/2025
FROM	25.00000ml of MP84637 + 75.00000	ml of MP846	636 = Final Q	uantity: 100.00	0 ml			



Recipe ID 3913 FROM	NAME ICP AES STD S2 16.00000ml of MP84637 + 184.0000	<u>NO.</u> <u>MP84640</u> 0ml of MP84	Prep Date 02/25/2025 4636 = Final	Expiration Date 03/25/2025 Quantity: 200.0	Prepared By Kareem Khairalla	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal 02/28/2025
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Expiration</u> Date	<u>Prepared</u> <u>By</u>	ScaleID	PipetteID	Supervised By
<u>15</u> 2950	ICP AES S1/CRI STOCK STD	<u>MP84641</u>	02/25/2025	03/09/2025	Kareem Khairalla	None	None	Sarabjit Jaswal 02/28/2025
FROM	0.00200ml of M5816 + 0.00400ml of of M5658 + 0.05000ml of M5811 + 0. 0.10000ml of M5801 + 0.10000ml of of M5800 + 0.20000ml of M5748 + 0.	05000ml of M5820 + 0. 20000ml of	M6030 + 0.06 10000ml of M M5799 + 0.20	6000ml of M574 5962 + 0.10000 0000ml of M602	47 + 0.10000ml 0ml of M5970 + 21 + 0.20000ml	of M5472 + 0.10 0.10000ml of M of M6023 + 0.2	0000ml of M57 16128 + 0.1500 0000ml of M61	751 + 00ml 145 +

0.25000ml of M5467 + 0.25000ml of M6146 + 0.50000ml of M5798 + 0.50000ml of M5814 + 0.50000ml of M6032 + 1.00000ml of M5192 + 1.00000ml of M5288 + 1.00000ml of M5497 + 1.00000ml of M6127 + 1.00000ml of M6144 + 77.68000ml of

MP84636 = Final Quantity: 100.000 ml



Recipe ID 2951	NAME ICP AES S1/CRI WORK STD	<u>NO.</u> MP84642	Prep Date 02/25/2025	Expiration Date 03/09/2025	Prepared By Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	2.00000ml of MP84641 + 98.00000m	nl of MP8463	36 = Final Qu	antity: 100.000	ml			

<u>Recipe</u> <u>ID</u> 912	NAME ICP AES ICV SOLN	<u>NO.</u> MP84643	<u>Prep Date</u> 02/25/2025	Expiration Date 03/25/2025	Prepared By Kareem Khairalla	<u>ScaleID</u> None	PipettelD None	Sarabjit Jaswal
<u>FROM</u>	0.02500ml of M5429 + 0.02500ml of of M5472 + 10.00000ml of M6150 + 8					0.25000ml of M	5218 + 0.2500	IOml



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Recipe ID 904	NAME ICP AES ICSA SOLN	<u>NO.</u> MP84644	Prep Date 02/24/2025	Expiration Date 03/25/2025	Prepared By Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
<u>FROM</u>	25.00000ml of M6152 + 225.00000m	l of MP8463	6 = Final Qu	antity: 250.000	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>	PipettelD	Sarabjit Jaswal
911	ICP AES CCV SOLN	<u>MP84646</u>	02/25/2025	03/25/2025	Kareem	None	None	
					Khairalla			02/28/2025
FROM	50.00000ml of MP84636 + 50.00000	ml of MP846	637 = Final Q	uantity: 100.00	0 ml			



Recipe ID 919	NAME ICP AES INTERNAL STD	<u>NO.</u> MP84649	<u>Prep Date</u> 02/25/2025	Expiration Date 03/25/2025	Prepared By Kareem Khairalla	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
FROM	1.00000ml of M5959 + 10.00000ml o	f M5985 + 1	969.00000ml	of W3112 + 20	.00000ml of M5	789 <i>=</i> Final Qu	antity: 2000.00	
Recipe				Expiration	Prepared			Supervised By

<u>Recipe</u>				Expiration	Prepared			<u>Supervised By</u>
<u>ID</u>	NAME	<u>NO.</u>	<u>Prep Date</u>	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
513	RINSE SOLN	<u>MP84650</u>	02/25/2025	03/25/2025	Kareem	None	None	-
					Khairalla			02/28/2025
FROM	200.00000ml of M5789 + 9800.0000	Oml of W311	2 = Final Qu	antity: 10000.0	00 ml			



<u>Recipe</u> <u>ID</u> 170	NAME 1:1HCL	<u>NO.</u> MP84720	Prep Date 03/03/2025	Expiration Date 04/04/2025	<u>Prepared</u> <u>By</u> Sagar Kanani	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_1 (ICP	
FROM	1000.00000ml of M6151 + 1000.0000	00ml of W31	12 = Final Q	uantity: 2000.00			- <u>A</u>) -	

<u>Recipe</u> <u>ID</u> 3494	NAME ICP AES ICSAB SOLN-1	<u>NO.</u> MP84721	Prep Date 02/25/2025	Expiration Date 03/25/2025	Prepared By Kareem Khairalla	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
<u>FROM</u>	0.01000ml of M5815 + 0.01000ml of of M6152 + 10.00000ml of M6155 + ⁻					0.10000ml of M	5970 + 10.000	000ml



Recipe ID 871	NAME MERCURY INTERMEDIATE B 250PPB WORKING STD.	<u>NO.</u> MP84759	Prep Date 03/05/2025	Expiration Date 03/06/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
<u>FROM</u>	1.00000ml of M6126 + 2.50000ml of	M5062 + 96	5.50000ml of V	V3112 = Final	Quantity: 100.0	00 ml	<u> </u>	
Pacino				Expiration	Proparod			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>	PipettelD	Sarabjit Jaswal
1346	Hg ICV SOLUTION	<u>MP84766</u>	03/05/2025	03/06/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	03/05/2025
FROM	2.50000ml of M5532 + 2.50000ml of	M6126 + 24	5.00000ml of	W3112 = Fina	I Quantity: 250.0	000 ml	<u>^</u>)	



FROM

A)

Metals STANDARD PREPARATION LOG

Recipe ID 1358 FROM	NAME CCV (Hg 5.0 PPB SOLUTION) 485.00000ml of W3112 + 5.00000ml	<u>NO.</u> MP84768 of M6126 +	Prep Date 03/05/2025 10.00000ml c	Expiration Date 03/06/2025	Prepared <u>By</u> Mohan Bera Final Quantity: 5	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 03/05/2025
<u>Recipe</u> <u>ID</u> 1349	NAME CRA/CRI (Hg 0.2 PPB SOLUTION)	<u>NO.</u> MP84770	Prep Date 03/05/2025	Expiration Date 03/06/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_5 (HG	Sarabjit Jaswal 03/05/2025

2.50000ml of M6126 + 247.30000ml of W3112 + 0.20000ml of MP84759 = Final Quantity: 250.000 ml



Recipe ID 871	NAME MERCURY INTERMEDIATE B 250PPB WORKING STD.	<u>NO.</u> MP84776	Prep Date 03/06/2025	Expiration Date 03/07/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
FROM	1.00000ml of M6126 + 2.50000ml of	M5062 + 96	5.50000ml of V	V3112 = Final	Quantity: 100.00	00 ml	A)	

Recipe <u>ID</u> 1340	NAME Hg 0.00 PPB STD	<u>NO.</u> MP84777	Prep Date 03/06/2025	Expiration Date 03/07/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
FROM	2.50000ml of M6126 + 247.50000ml	of W3112 =	Final Quanti	ty: 250.000 ml	<u>.</u>		<u>Α</u>)	



Recipe ID 1341 FROM	NAME Hg 0.2 PPB STD 2.50000ml of M6126 + 247.30000ml	<u>NO.</u> MP84778 of W3112 +	Prep Date 03/06/2025 0.20000ml of	Expiration Date 03/07/2025 MP84776 = F	Prepared By Mohan Bera	ScaleID None	PipetteID METALS_PIP ETTE_5 (HG A)	Supervised By Kareem Khairalla 03/10/2025
Recipe ID 1342	NAME Hg 2.5 PPB STD	<u>NO.</u> MP84779	Prep Date 03/06/2025	Expiration Date 03/07/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG A)	Supervised By Kareem Khairalla 03/10/2025



Recipe ID 1343 FROM	NAME Hg 5.0 PPB STD 2.50000ml of M6126 + 242.50000ml	<u>NO.</u> MP84780 of W3112 +	Prep Date 03/06/2025 5.00000ml of	Expiration Date 03/07/2025 MP84776 = F	Prepared By Mohan Bera	ScaleID None	PipettelD METALS_PIP ETTE_5 (HG A)	Supervised By Kareem Khairalla 03/10/2025
<u>Recipe</u> <u>ID</u> 1344	NAME Hg 7.5 PPB STD	<u>NO.</u> MP84781	Prep Date 03/06/2025	Expiration Date 03/07/2025	<u>Prepared</u> <u>By</u> Mohan Bera	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP	<u>Supervised By</u> Kareem Khairalla



<u>Recipe</u> <u>ID</u> 1345	NAME Hg 10.0 PPB STD	<u>NO.</u> MP84782	Prep Date 03/06/2025	Expiration Date 03/07/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
FROM	2.50000ml of M6126 + 237.50000ml	of W3112 +	10.00000ml c	of MP84776 = I	Final Quantity: 2	250.000 ml	A)	
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	<u>Supervised By</u> Kareem Khairalla

<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Kareem Khairalla
1346	Hg ICV SOLUTION	<u>MP84783</u>	03/06/2025	03/07/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	03/10/2025
FROM	2.50000ml of M5532 + 2.50000ml of	M6126 + 24	5.00000ml of	W3112 = Fina	I Quantity: 250.	000 ml	A)	



Recipe ID 1351	NAME ICB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> MP84784	Prep Date 03/06/2025	Expiration Date 03/07/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
<u>FROM</u>	2.50000ml of M6126 + 247.50000ml	of W3112 =	Final Quantit	y: 250.000 ml			<u>A)</u>	
Recipe				Expiration	Prepared			Supervised By

Recipe				Expiration	Prepared			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Kareem Khairalla
1358	CCV (Hg 5.0 PPB SOLUTION)	<u>MP84785</u>	03/06/2025	03/07/2025	Mohan Bera	None	METALS_PIP	
							ETTE_5 (HG	03/10/2025
FROM	485.00000ml of W3112 + 5.00000ml	of M6126 +	10.00000ml c	of MP84776 =	Final Quantity:	500.000 ml	- A) -	



<u>Recipe</u> <u>ID</u> 1352	NAME CCB (Hg 0.00 PPB SOLUTION)	<u>NO.</u> MP84786	Prep Date 03/06/2025	Expiration Date 03/07/2025	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	
<u>FROM</u>	495.00000ml of W3112 + 5.00000ml	of M6126 =	Final Quantit	y: 500.000 ml			A)	
<u>Recipe</u> <u>ID</u>	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u> Kareem Khairalla

Recipe					riepareu			Supervised by
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Kareem Khairalla
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	<u>MP84787</u>	03/06/2025	03/07/2025	Mohan Bera	None	METALS_PIP ETTE_5 (HG	
FROM	2.50000ml of M6126 + 247.30000ml	of W3112 +	0.20000ml of	MP84776 = F	inal Quantity: 25	i0.000 ml	- A) ·	



Recipe ID 1350 FROM	NAME CHK STD (Hg 7.0 PPB SOLUTION) 2.50000ml of M6126 + 240.50000ml	<u>NO.</u> <u>MP84788</u> of W3112 +	Prep Date 03/06/2025 7.00000ml of	Expiration Date 03/07/2025 MP84776 = F	Prepared By Mohan Bera inal Quantity: 25	<u>ScaleID</u> None 50.000 ml	PipettelD METALS_PIP ETTE_5 (HG A)	
Recipe ID 68	NAME STANNOUS CHLORIDE SOLUTION	<u>NO.</u> MP84790	Prep Date 03/06/2025	Expiration Date 03/07/2025		<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)		Supervised By Kareem Khairalla 03/10/2025

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



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	07/01/2019 / RICHARD	06/07/2019 / RICHARD	M4371
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3238-05 / Potassium Persulfate (2.5kg)	0000234156	08/06/2025	07/23/2019 / jaswal	07/25/2019 / manojkumar	M4465
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	030921	03/09/2025	08/06/2021 / jaswal	08/05/2021 / jaswal	M4884
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3227-05 / Potassium Permanganate (2.5kg)	210800	03/31/2026	11/30/2022 / mohan	07/28/2021 / mohan	M4916
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	MSHG-10PPM / MERCURY HCI 125mL 10ug/mL	S2-HG709270	09/22/2026	05/28/2022 / mohan	01/27/2022 / mohan	M5062
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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



M-QC-4 / M-QC-4, Second rce, 1000 ug/ml, B, Mo, Sn, Ti ItemCode / ItemName 9 / K, 10000 PPM, ml	S2-MEB711674 Lot # 071122	11/02/2026 Expiration Date 07/11/2025	07/01/2022 / bin Date Opened / Opened By 09/01/2022 / jaswal	09/10/2021 / bin Received Date / Received By 07/21/2022 / jaswal	M5218 Chemtech Lot # M5288
9 / K, 10000 PPM,		Date	Opened By 09/01/2022 /	Received By 07/21/2022 /	Lot #
	071122	07/11/2025			M5288
ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
51Q / M-CLP-4/.25L	S2-MEB711673	11/02/2026	09/19/2022 / jaswal	08/20/2022 / jaswal	M5296
ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
	T2-MEB714159	01/13/2027	01/30/2024 / bin	09/19/2022 / bin	M5395
l	temCode / ItemName -CAL-3 / CLP CAL ITION #3, 125mL	-CAL-3 / CLP CAL T2-MEB714159	-CAL-3 / CLP CAL T2-MEB714159 01/13/2027	-CAL-3 / CLP CAL T2-MEB714159 01/13/2027 01/30/2024 /	-CAL-3 / CLP CAL T2-MEB714159 01/13/2027 01/30/2024 / 09/19/2022 /

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57103 / Li, 10000 PPM, 125 ml	070622	07/06/2025	01/30/2023 / bin	01/26/2023 / bin	M5429

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57058 / Cerium, 1000PPM, 100ML	020623	02/06/2026	03/06/2023 / bin	03/01/2023 / bin	M5467



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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	082922	08/29/2025	01/14/2025 / Jaswal	03/16/2023 / jaswal	M5472
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 #
EPA	ICV-5 / ICV (HG)STOCK SOLN	ICV5-0415	03/15/2025	01/02/2025 / jaswal	03/30/2023 / mohan	M5532
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	060523	06/05/2026	08/28/2023 / jaswal	08/25/2023 / jaswal	M5658
Supplier	ItemCode / ItemName	Lot #	Expiration	Date Opened /	Received Date /	Chemtech

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Lead (Pb) 1000PPM	100923	10/09/2026	05/20/2024 / Jaswal	12/20/2023 / jaswal	M5747



500 ml

Standards, Inc.

Jaswal

jaswal

M5751

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Nickel (Ni) 1000PPM	091223	09/12/2026	01/02/2024 / bin	12/20/2023 / jaswal	M5748
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute	58029 / Cu, 1000 PPM,	071723	07/17/2026	10/01/2024 /	08/25/2023 /	M5751

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)	23G1262003	07/30/2025	02/08/2024 / Al-Terek	06/26/2023 / Al-Terek	M5789

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)	22D1462006	08/05/2025	02/05/2024 / Al-Terek	02/24/2022 / Al-Terek	M5792
	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed	BA-9530-33 / Hydrochloric 22D1462006 Acid, Instra-Analyzed	ItemCode / ItemNameLot #DateBA-9530-33 / Hydrochloric22D146200608/05/2025Acid, Instra-Analyzed08/05/2025	ItemCode / ItemNameLot #DateOpened ByBA-9530-33 / Hydrochloric Acid, Instra-Analyzed22D146200608/05/202502/05/2024 / Al-Terek	ItemCode / ItemNameLot #DateOpened ByReceived ByBA-9530-33 / Hydrochloric Acid, Instra-Analyzed22D146200608/05/202502/05/2024 /02/24/2022 /Al-TerekAl-TerekAl-Terek

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



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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.	57027 / CO, 1000 PPM, 125 ml	091923	09/19/2026	05/31/2024 / bin	02/09/2024 / bin	M5800
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57033 / As, 1000 PPM, 125 ml	111323	11/13/2026	02/09/2024 / bin	02/09/2024 / bin	M5801
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	051523	05/15/2026	02/06/2025 / kareem	01/03/2024 / jaswal	M5811
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	071123	07/11/2026	03/26/2024 / Sohil	01/03/2024 / jaswal	M5814
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	041723	04/17/2026	05/21/2024 / Jaswal	02/09/2024 / jaswal	M5815
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	122923	12/29/2026	05/20/2024 / Jaswal	02/09/2024 / jaswal	M5816



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
					1	
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	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL	T2-MEB714417	01/27/2027	04/19/2024 / jaswal	02/22/2024 / jaswal	M5875
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Soldlor Chomical	RA 3080 01 / Stappous	222820	08/21/2028	04/30/2024 /	04/25/2024 /	

Supplier	itemcode / itemname	LOT #	Date	Opened By	Received By	Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	232820	08/31/2028	04/30/2024 / mohan	04/25/2024 / mohan	M5882

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000281938	07/06/2026	04/30/2024 / mohan	04/25/2024 / mohan	M5884
Seidier Chemical	Chloride, Crystal	0000281938	07/06/2026			MS

ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
CGY10-1 / YTTRIUM 125mL 10,000ug/mL	V2-Y740548	02/20/2029	07/01/2024 / Jaswal	06/14/2024 / Jaswal	M5959
	GY10-1 / YTTRIUM	GY10-1 / YTTRIUM V2-Y740548	ItemCode / ItemName Lot # Date GY10-1 / YTTRIUM V2-Y740548 02/20/2029	ItemCode / ItemName Lot # Date Opened By GY10-1 / YTTRIUM V2-Y740548 02/20/2029 07/01/2024 /	ItemCode / ItemName Lot # Date Opened By Received By GY10-1 / YTTRIUM V2-Y740548 02/20/2029 07/01/2024 / 06/14/2024 /



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 #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	061224	06/21/2027	07/01/2024 / Jaswal	07/01/2024 / Jaswal	M5970
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGTI1-1 / TITANIUM 125mL 1000ug/mL			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 #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	U2-IN729349	02/21/2028	10/08/2024 / Jaswal	06/14/2024 / Jaswal	M5985
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml	T2-MEB723367	08/26/2025	02/26/2025 / Eman	05/14/2024 / Jaswal	M6003
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #

Supplier	ItemCode / ItemName	Lot #	Date	Opened By	Received By	Lot #
Inorganic Ventures	WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml	U2-MEB731108	07/14/2025	01/14/2025 / Eman	05/14/2024 / Jaswal	M6011



Supplier	Supplier ItemCode / ItemName		Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #			
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	062424	06/24/2027	09/28/2024 / jaswal	08/05/2024 / Jaswal	M6021			
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #			
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	0624724	06/27/2027	08/05/2024 / kareem	08/05/2024 / Jaswal	M6023			
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #			
Absolute Standards, Inc.	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 Opened /	Received Date /	Chemtech			

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	010924	01/09/2027	01/14/2025 / Jaswal	08/05/2024 / Jaswal	M6032

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

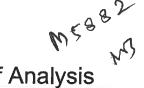


Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	V2-MEB746762	09/06/2029	01/23/2025 / kareem	09/19/2024 / kareem	M6077	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	06/03/2025	12/03/2024 / Janvi	11/12/2024 / Janvi	M6126	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	112124	11/21/2027	01/13/2025 / kareem	01/13/2025 / kareem	M6127	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	101124	10/11/2027	01/13/2025 / kareem	01/13/2025 / kareem	M6128	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	072424	07/24/2027	01/23/2025 / kareem	01/13/2025 / Jaswal	M6144	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.			12/17/2027	02/04/2025 / jaswal	01/13/2025 / Jaswal	M6145	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	071724	07/17/2027	01/31/2025 / kareem	10/18/2024 / kareem	M6146
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV1-1014			04/20/2021 / JANVI	M6150
Supplier	ItemCode / ItemName	mName Lot # Expiration Date Opened Opened By		Received Date / Received By	Chemtech Lot #	
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22G2862015	08/18/2025	02/18/2025 / Sagar	01/15/2025 / Sagar	M6151
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	08/24/2025	02/24/2025 / kareem	04/20/2021 / kareem	M6152
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	ICSB-0710	06/20/2025	02/10/2025 / kareem	02/09/2024 / kareem	M6155
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
	DIW / DI Water	Daily Lab-Certified	07/03/2029	07/03/2024 /	07/03/2024 /	

Certificate of Analysis Thermo Fisher SCIENTIFIC



Page 1 of 1

Certificate of Analysis 1 Reagent Lane Fair Lawn, NJ 07410 Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System 201,796,7100 tel Standard ISO9001:2015 by SAI Global Certificate Number CERT - 0120633 201.796.1329 fax

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

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

N/A	He Manual March		
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Clear crystals
ASSAY	%	Inclusive Between 98 - 103	100.65
CALCIUM	%	<= 0.005	0.0017
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
IRON (Fe)	%	<= 0.003	0.0011
LEAD (Pb)	%	<= 0.01	0.0006
MERCURY (Hg)	ppm	<= 0.05	<0.05
POTASSIUM (K)	%	<= 0.005	0.0001
SODIUM (Na)	%	<= 0.01	<0.01
SOLUBILITY IN HCL	PASS/FAIL	= PASS TEST	PASS TEST
SULFATE (SO4)	PASS/FAIL	= P.T. (ABOUT 0.003%)	P.T. (ABOUT 0.003%)

ut Sabyr

Harout Sahagian - Quality Control Supervisor - Fair Lawn

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

*Based on suggested storage condition.

m/z->	N. 5 11 0	m/≥-≫ 5.0⊑6	m/z-> 2.0回5 1.0回5	2.0 同の の	1. Barium nitrate (Ba)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	CERTIFIED WEIGHT REPORT: Part A Lot A Desc	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
N		110	10	[1] Spectrum No.1	IN02	RM#	Expiration Date:010927Recommended Storage:Ambient (Il Concentration (µg/mL):1000NIST Test Number:6UTBWeight shown below was diluted to (mL):	<u>PORT:</u> Part Number: Lot Number: Description:	om om
ນ ວ		120	N O		IN023 BAD022019A1 1	Lot Number	20	<u>57056</u> 010924 Barium (Ba)	
).		130	Q O	12.514 sec]:58156.D# [Count] [Linear]	1000 99.999	Nominal Purity Unc Conc. (µg/mL) (%) Pu	5E-05 00.02		R1815
240		140	4 0	56. D# [Cour	0.10 52.3 3	Uncertainty Assay Purity (%) (%) W	2% Balance Uncertainty Flask Uncertainty		ertified Refere १२-५
		150 160	0 0 0	t] [Linear]	3.82417 3.82441	Target Actual Weight (g) Weight (g)	40.0 Nitric Acid (mL)	46	Certified Reference Material CRM 1/2-4
I		0 170	70		1 1000.1	Actual Conc. (µg/mL)			:RM М6032
		180	8- 0		2.0 10022-31-8	Expanded Uncertainty (So +/- (µg/mL) CAS#	Formulated By:	Hiovanni	-
		190 Varian	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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	<0.02	A 103	48	<0.02	<0.02	20.02	20.02	2003	AND		

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	2.5 4	5.0而4	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		[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		Š		-	IN024 CDM092021A1	Lot Number	6UTB uted to (mL):	070127 Ambient (20 °C) 1000	<u>57048</u> <u>070124</u> Cadmium (Cd)		
		130		30 0		12.514 500	1000 99.	Nominal Pu Conc. (µg/mL) (1	2000.07 0.1		(Cd)		R
200		140		À		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 () ()		50		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 0		ar'j	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

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Part # 57048

Lot # 070124

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

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

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Physical Characterization:

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

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Certified by:

* 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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M5296 OP: 09/19/2022 BH



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custom Grade Solution	n
Catalog Number:	CHEM-CLP-4	
Lot Number:	S2-MEB711673	
Matrix:	3% (v/v) HNO3 3% (v/v) HF	
Value / Analyte(s):	1 000 μg/mL ea: Boron, Silicon, Titanium	Molybdenum, Tin,

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 6 μg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 6 μg/mL	
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 6 µg/mL	
Titanium, Ti	1 000 ± 7 μg/mL			
Density:	1.030 g/mL (meas	sured at 20 ± 4 °C)		
Assay Information	n:			
ANALYTE	METHOD	NIST SRM#		SRM LOT#
B	ICP Assav	3107		110830

В	ICP Assay	3107	110830
Мо	ICP Assay	3134	130418
Si	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

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: $w_i = (1/u_{chari})^2 / (\Sigma(1/(u_{chari})^2)$	$\mathbf{u}_{char \ a}$ = 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 (±) = $U_{CRM/RM} = k (u_{chara}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$
k = coverage factor = 2	k = coverage factor = 2
$\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}})^2)\right]^{\frac{1}{2}}$ 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	ubb = 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 $4^{\circ} - 24^{\circ}$ C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

November 02, 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

- November 02, 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



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

3.0

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution		
Catalog Number:	CLPP-CAL-1		
Lot Number:	T2-MEB714417		
Matrix:	5% (v/v) HNO3		
Value / Analyte(s):	5 000 μg/mL ea: Calcium, Magnesium,	Potassium, Sodium,	
	2 000 μg/mL ea: Aluminum,	Barium,	
	1 000 μg/mL ea: Iron,		
	500 μg/mL ea: Nickel, Zinc, Manganese,	Vanadium, Cobalt,	
	250 μg/mL ea: Silver,	Copper,	
	200 μg/mL ea: Chromium,		
	50 μg/mL ea: Beryllium		
CERTIFIED VALUE	S AND UNCERTAINTIES		

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

Density:

1.118 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE Ag	METHOD ICP Assay	NIST SRM# 3151	SRM LOT# 160729
Ag	Volhard	999c	999c
AI	ICP Assay	3101a	140903
AI	EDTA	928	928
Ва	ICP Assay	3104a	140909
Ва	Gravimetric		See Sec. 4.2
Ве	ICP Assay	3105a	090514
Ве	Calculated		See Sec. 4.2
Са	ICP Assay	3109a	130213
Са	EDTA	928	928
Со	ICP Assay	3113	190630
Со	EDTA	928	928
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
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
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	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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 27, 2022

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

11.2 Lot Expiration Date

- January 27, 2027

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

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

11.3 Period of Validity

- 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

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custom Grade Solution		
Catalog Number:	CLPP-CAL-3		
Lot Number:	T2-MEB714159		
Matrix:	7% (v/v) HNO3		
Value / Analyte(s):	1 000 μg/mL ea: Arsenic, Selenium,	Lead, Thallium,	
	500 μg/mL ea: Cadmium		

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Arsenic, As	CERTIFIED VALUE 1 000 ± 8 µg/mL	ANALYTE Cadmium, Cd	CERTIFIED VALUE 500.0 ± 2.1 μg/mL
Lead, Pb	1 000 ± 5 μg/mL	Selenium, Se	1 000 ± 8 μg/mL
Thallium, Tl	1 000 ± 7 μg/mL		

Density:

1.043 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods Certified Value, X _{CRM/RM} , where two or more methods of characterization are	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 $4^{\circ} - 24^{\circ}$ 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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

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

11.2 Lot Expiration Date

- January 13, 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

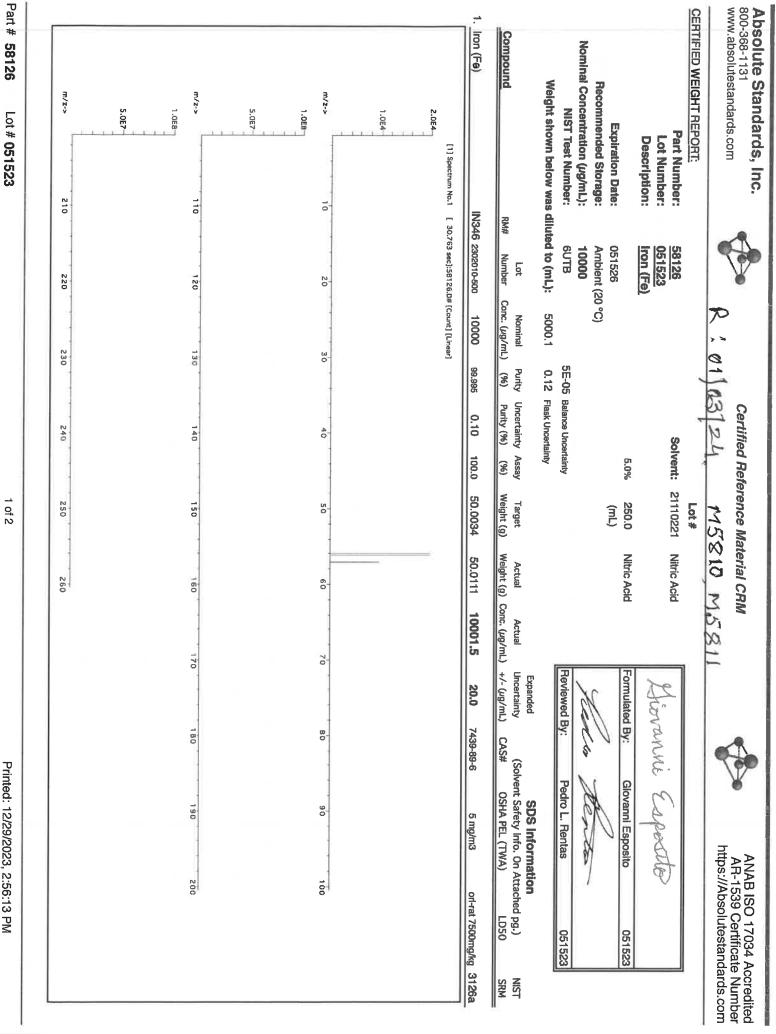
Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines



1 of 2

Printed: 12/29/2023, 2:56:13 PM

11. 2015 BT 70000 an	4002 C: 4002 Fe 4		Trace Metals Verification by ICP-MS (µg/mL)	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Description Descring <thdescring< th=""> Descring <thd< th=""><th></th></thd<></thdescring<>	
	(T) = Target analyte	(T) = Target analyte	(T) = Target analyte	Is Verification by ICP-MS (µg/mL) 4002 Ni 40.0 Pi Mi Mi Mi Mi	etrometry (ICP-MS): Is Verification by ICP-MS (μ g/mL) $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	trified Reference Material CRMCtrometry (ICP-MS):Is Verification by ICP-MS (µg/mL) 4002 Ni 402 Ni 402 4002 Ni 402 Re 402 32 4002 Re 402 32 32 402 402 Re 402 32 32 402 402 Re 402 32 32 402 402 Re 402 32 32 402 1 402 32 32 33 402 1 402 32 32 32 33 402 1 402 32 32 33 402 1 402 32 32 33 402 1 402 32 32 33 402 1 402 32 32 33 402 1 402 32 32 33 402 1 402 32 32 33 402 1 402 32 32 33 402 1 402 32 32 33 402 1 402 32 33 402 1 302 33 302 33 1 402 32

2 of 2

Certificate of Analysis

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

INORGANIC" V E N T U R E S

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	WW-LFS-1
Lot Number:	T2-MEB723367
Matrix:	5% (v/v) HNO3

	Value / Analyte(s):	1 000 µg/mL ea: Potassium,		
		600 μg/mL ea: Phosphorus,		
		300 µg/mL ea: Sodium,	Iron,	
		200 µg/mŁ ea: Magnesium, Cerium, Thallium,	Aluminum, Selenium,	
		100 µg/mL ea: Lead,	Calcium,	
		80 μg/mL ea: Arsenic,		
		70 μg/mL ea: Mercury,		
		50 μg/mL ea: Nickel,		
		40 µg/mL ea: Chromium,		
		30 µg/mL ea: Copper, Vanadium,	Boron,	
		20 μg/mL ea: Zinc, Barium, Cadmium, Manganese,	Strontium, Beryllium, Cobalt, Lithium,	
3.0	CERTIFIED VALUES	7.5 µg/mL ea: Silver AND UNCERTAINTI	ES	

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

Density:

1.034 g/mL (measured at 20 \pm 4 °C)

Assay Information:

ANALYTE Ag	METHOD ICP Assay	NIST SRM# 3151	SRM LOT# 160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
A	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
В	ICP Assay	3107	190605
Ba	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
Се	ICP Assay	3110	090504
Ce	EDTA	928	928
Co	ICP Assay	3113	190630
Со	EDTA	928	928
Cr	ICP Assay	3112a	170630
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
к	ICP Assay	3141a	140813
к	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	Traceable to 3152A	S2-NA700842
Na	Gravimetric	0400	See Sec. 4.2
Ni Ni	ICP Assay	3136	120619
P	EDTA	928 3139a	928
P	ICP Assay Acidimetric		060717
F Pb	ICP Assay	84L 3128	84L
Pb	EDTA	928	101026 928
Se	ICP Assay	3149	920 100901
Sr	EDTA	928	928
Sr	ICP Assay	Traceable to 3153a	920 K2-SR650985
TI	ICP Assay	3158	151215
V	IC Assay	3165	160906
v	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928
	Eco 4		

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

Characterization of CRM/RM by Two or More Methods	Characterization of CRM/RM by One Method
Certified Value, X _{CRMRM} , where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results:
$\begin{split} & X_{CRM/RM} \equiv \Sigma(w_i) \; (X_i) \\ & X_i = \text{mean of Assay Method i with standard uncertainty } u_{char, i} \\ & w_i = \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ & w_i = (1/u_{char, i})^2 / (\Sigma(1/(u_{char, i})^2)) \end{split}$	$X_{CRM/RM} = (X_a) (u_{char a})$ $X_a = mean of Assay Method A with u_{char a} = the standard uncertainty of characterization Method A$
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k $(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{V_2}$ k = coverage factor = 2 $u_{char} = [\Sigma[(w_i)^2 (u_{char}_i)^2])^{V_2}$ where u_{char} is the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty $u_{lts} = long term stability standard uncertainty (storage) u_{te} = transport stability standard uncertainty$	CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{chara} + u^2_{bb} + u^2_{tts} + u^2_{ts}$) ^{1/k} k = coverage factor = 2 u _{chara} = the errors from characterization u _{bb} = bottle to bottle homogeneity standard uncertainty u _{Its} = long term stability standard uncertainty (storage) u _{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)

6.0 INTENDED USE

4.0

- 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

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

8.0 **HAZARDOUS INFORMATION**

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

9.0 HOMOGENEITY

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

10.0 **QUALITY STANDARD DOCUMENTATION**

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 30, 2022

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

11.2 Lot Expiration Date

- August 30, 2026

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

- The lot expiration date reflects the period of time that the stability of a 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

Page 6 of 6

Certificate of Analysis

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

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

1.0 ACCREDITATION / REGISTRATION

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VENTURES

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



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	WW-LFS-2
Lot Number:	U2-MEB731108
Matrix:	5% (v/v) HNO3 tr. HF
Value / Analyte(s):	200 μg/mL ea: Silica,
	80 μg/mL ea: Antimony,
	70 μg/mL ea: Tin,
	40 μg/mL ea: Molybdenum,
	20 μg/mL ea:
	Titanium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Antimony, Sb	CERTIFIED VALUE 80.1 ± 0.6 µg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 40.03 ± 0.18 µg/mL
Silica, SIO2	200.2 ± 1.3 μg/mL	Tin, Sn	70.0 ± 0.4 µg/mL
Titanium, Ti	20.01 ± 0.13 μg/mL		

Density:

1.025 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE Mo	METHOD ICP Assay	NIST SRM# 3134	SRM LOT# 130418
Мо	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
SiO2	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
π	ICP Assay	3162a	130925
ті	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_{CRWRM}, where two or more methods of characterization are used is the weighted mean of the results:

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

 X_i = mean of Assay Method i with standard uncertainty 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 (±) = $U_{CRM/RM} \simeq k \left\{ u_{char}^2 + u_{bb}^2 + u_{ts}^2 + u_{ts}^2 \right\}^{\frac{1}{2}}$

k = coverage factor = 2

 $\begin{array}{l} u_{char} = [\overline{\Sigma}((w_{i})^{2} \, (u_{char})^{2})]^{2} \ \ \, \mbox{ where } u_{char} \ \, _{i} \mbox{ are the errors from each characterization method} \\ u_{bb} = bottle \ \, \mbox{ bottle homogeneity standard uncertainty} \\ u_{hs} = long \ \, \mbox{ term stability standard uncertainty (storage)} \end{array}$

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:

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

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

 $\label{eq:coverage factor = 2} \\ u_{char} a = the errors from characterization \\ u_{bb} = bottle to bottle homogeneity standard uncertainty$ $u_{its} = long term stability standard uncertainty (storage)$ $u_{its} = transport stability standard uncertainty$

- 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)

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

- For more information, visit www.inorganicventures.com/TCT HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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 17, 2023

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

11.2 Lot Expiration Date

- March 17, 2028

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

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

- 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

3D978

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

M4371

Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent Suitable for Mercury Determination (hydroxylammonium chloride)

Rec - 06.07.12



avantor

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

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Test	Specification	Result
ssay (NH₂OH · HCl) (by KMnO₄ titrn)	>= 96.0 %	99.1
larity of Alcohol Solution	Passes Test	PT
esidue after Ignition	<= 0.050 %	0.017
itrable Free Acid (meq/g)	<= 0.25	0.19
mmonium (NH4)	Passes Test	РТ
ulfur Compounds (as SO4)	<= 0.005 %	< 0.003
race Impurities – ACS – Heavy Metals (as Pb)	<= 5 ppm	4
race Impurities – Iron (Fe)	<= 5 ppm	< 3
race Impurities – Mercury (Hg)	<= 0.050 ppm	< 0.005

For Laboratory, Research or Manufacturing Use

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



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

James 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

dited nber .com			
Accre te Nui dards	NIST III	NA	
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	030921 030921 030921 030921 Attached pg.)	orl-rat 70 mg/kg	20 20 30
AN/ AR: https:	Lawrence Barry Lawrence Barry Pedro L. Rentas Pedro L. Rentas SDS Information (Solvent Safety Info. On Attached pg.)	2.50 mg/m3	
	CAS		
	Formulated By: Reviewed By: Expanded Uncertainty +/- (µg/mL)	51	
MF	Nitric Acid Final	1000.0	
Certified Reference Material CRM	Solvent: Nitric Acid 60.0 (mL) (mL) Conc. (µg/mL)	8	
leference I	Lot # 19410105 2.0% ainty ity Nominal Conc. (ug/mL)	0.1000 300.0 0.084 1000 100 31.393 sec]:58014.D# [Count] [Linear]	0 20 12 12 12 12 12 12 12 12 12 12 12 12 12
Certified F	19 5E-05 Balance Uncertainty 0.058 Flask Uncertainty Initial Uncertainty I Vol. (mL) Pipette (mL) Con	0.084 0.084 0.084	04 04 0 0 0 0 0 0
_	5E-05 0.058 Initial	300.0	
	1) 3°C) 3000.41 Dilution Factor	0.1000	
	57014 57014 030921 030921 Silicon (Si) 030924 030924 0100 1000 6UTB ed to (mL): 30 Lot D Lot D	[0] [0] [1] [1] [1] [1] [1] [1] [1] [1] [1] [1	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
¥~~	was dilu Number	2 [28]	
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: 57014 Lot Number: 030921 Description: 51licon (S Recommended Storage: Ambient (2 Nominal Concentration (µg/mL): 1000 NST Test Number: 6UTB Volume shown below was diluted to (mL): Part Lot Mumber Part Number Lot Number	OO OO	2.0E6 2.0E6 1.0E6 1.0E6 5.0E5 5.0E5 71 1.0E6 71 71 71 71 71 71 71 71 71 71 71 71 71
Abso 800-36£ www.ab	CERTIFI		



	<0.02	Cd	<0.02	Dy	<0.02	Ηf	<0.02	Li	<0.02	N	<0.02	Pr	<0.02	Se	<0.2	$^{\mathrm{Tb}}$	<0.02	Μ	<0.02
	<0.02	Ca	<0.2	Er	<0.02	Но	<0.02	Lu	<0.02	dN	<0.02	Re	<0.02	Si	Τ	Te	<0.02	N	<0.02
	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	II	<0.02	>	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	ŀr	<0.02	Mn	<0.02	Ъd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	C	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Υ	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Мо	<0.02	Pt	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	<0.02	Αu	<0.02	Pb	<0.02	Νd	<0.02	К	<0.2	Sc	<0.02	Та	<0.02	Ï	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

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

Certified by:

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

Certificate of Analysis **ThermoFisher** S C I E N T I F I C

M4913-16

Page 1 of 1

Certificate of Analysis

1 Reagent Lane Fair Lawn, NJ 07410 201.796.7100 tel 201.796.1329 fax Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632

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

Catalog Number	P279	Quality Test / Release Date	01/12/2021
Lot Number	210306		
Description	POTASSIUM PERMANGANATE, A.C.S.	· · · · · · · · · · · · · · · · · · ·	
Country of Origin	United States	Suggested Retest Date	Jan/2026

N/A			
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Dark purple to purple green crystals
ASSAY	%	>= 99	99.3
CHLORIDE & CHLORATE	%	<= 0.005	<0.005
IDENTIFICATION	PASS/FAIL	= PASS TEST	pass test
INSOLUBLE MATTER	%	<= 0.2	<0.2
MERCURY (Hg)	ppm	<= 0.05	<0.004
SULFATE (SO4)	%	<= 0.02	<0.02

Julian Buston

Julian Burton - Quality Control Manager - Fair Lawn

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



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com M5062 M5063

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Mass Spec Solution
Catalog Number:	MSHG-10PPM
Lot Number:	S2-HG709270
Matrix:	10% (v/v) HCI
Value / Analyte(s):	10 µg/mL ea: Mercury
Starting Material:	Hg metal
Starting Material Lot#:	1959
Starting Material Purity:	99.9994%
CERTIFIED VALUES	AND UNCERTAINTIES

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

Assay Information:

3.0

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 22, 2021

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

11.2 Lot Expiration Date

- September 22, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong Supervisor, Product Documentation

Ulya new

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine

m/z->	1.0E6	2.0E6	m/z->	1000	2000	1.0E5	2.0E5	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		đ		[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.
2			120		N		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		G		sec]:5704	300.0	Initial Un Vol. (mL) Pip	0.058 Flas	5E-05 Bala					M.S.
			140		40 0		8.594 sec]:57042.D# [Count] [Linear]	0.084	Uncertainty N Pipette (mL) Conc	Flask Uncertainty	Balance Uncertainty			MKE	_	Certified Rep M.5192
			150		50		unt] [Líne	1000	Nominal Conc. (µg/mL) Co				0.5%	MKBQ8597V Am	Lot #	ference M.
			160		60)ar]	10001.0	Initial Conc. (µg/mL) C				15.0 » (mL)	Ammonium hydroxide		Certified Reference Material CRM いちいのえいたいのんりはてい
			170		70			1000.0	Final Conc. (µg/mL)	Г			Ammonium hydroxide	æ	-	M 172
								2.1	Expanded Uncertainty +/- (µg/mL)		Reviewed By:	N's	Formulated By:	A		
			180		80			13106-76-8	(Solve CAS#			to I		deronce		•
			190		90			5 mg(Mo)/m3	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		Pedro L. Rentas	era	Lawrence Barry	An		nt 、
			200		100			13 orl-rat 333 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50		s 051722	/	rry 051722	Ψ		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
								kg 3134	NIST		722		722			4 Accredite ate Numbe ndards.com

Part # 57042 Lot # 051722

1 of 2

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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 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	E	<0.02	h	<0.02	Mg	<0.01	ò	<007	Rh	50	۸,	2003	3	3	: (
Ba	40.02	S	<0.02	3	300	7	3	ξ,	2	2			10.02	26	70.02		20.02	<	20.02
Be	5	?	3	2	20.02	l =	70.02	UTAT	20.02	Pd	<0.02	Rb	<0.02	Na	40.2	Ъ	<0.02	ΥЪ	<0.02
2	-	2	70.02	Ca	20.02	He	<02	Hg	40.2	P	<0.02	Ru	<0.02	S	40.02	J	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	20.02	Sn	20.02	5	<0.02
					10.01	0.1	20.05	ING	20.02	~	40.2	Sc	<0.02	Ta	<0.02	Т	<0.02	72	<0.02
																			And in the second secon

(T)= Target analyte

Physical Characterization:

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

Son 1. S

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 # 57042 Lot # 051722



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

130925

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

Ti

Product Code:	Multi Analyte Custom Grade Solution	on
Catalog Number:	CHEM-QC-4	
Lot Number:	S2-MEB711674	
Matrix:	3% (v/v) HNO3 3% (v/v) HF	
Value / Analyte(s):	1 000 μg/mL ea: Boron, Silicon, Titanium	Molybdenum, Tin,

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ICP Assay

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 7 μg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 5 μg/mL	
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 5 μg/mL	
Titanium, Ti	1 001 ± 6 μg/mL			
Density:	1.032 g/mL (meas	sured at 20 ± 4 °C)		
Assay Information	ו:			
ANALYTE	METHOD	NIST SRM#		SRM LOT#
В	ICP Assay	3107		110830
Мо	ICP Assay	3134		130418
Si	ICP Assay	3150		130912
Sn	ICP Assay	3161a		140917

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.

3162a

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

November 02, 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

- November 02, 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

ADSOIUTE STANDARDS, INC. 800-368-1131 www.absolutestandards.com	com com		M	528	$\mathcal{N}528\% \qquad \text{R: } n7/21/20$	Referei R	nce Mati	erial CRN	RM 2029	V			ANAB IS AR-153 https://Ab	80 17034 / 9 Certificat solutestan	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
CERTIFIED WEIGHT REPORT Part Lot Des	<u>PORT:</u> Part Number: Lot Number: Description:	<u>58119</u> 071122 Potassium (K)	(Y)		Solv	Solvent: 20	Lot # 20510011	Nitric Acid	4	T	l general	2	t.		
Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below was	Expiration Date: 071125 Recommended Storage: Ambient (I Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	071125 Ambient (20 °C) 10000 6UTB ed to (mL): 20	0 °C) 2000.02	5E-05 Ba 0.058 Fil	29 5E-05 Balance Uncertainty 0.058 Flask Uncertainty	\ 0	40.0 (mL)	Nitric Acid		Formulated By:		Lawrence Barry		071122	
Compound	RM#	Lot Number	Nominal Conc. (µg/mL)		Uncertainty A Purity (%)	say %)	Target Weight (g) V	Actual Veight (g) C	Actual Actual Weight (g) Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	(Solv CAS#	SDS Information (Solvent Safety Info. On Attached pg.) CSHA PEL (TWA) LD5(r mation . On Attache 'WA)	id pg.) LD50	NIST
1. Potassium nitrate (K)	IN034	IN034 KD022021A1	10000	99.999	0.10 3	37.6 53	53.1925	53.1934	10000.2	20.0	7757-79-1	5 mg/m3		orl-rat 3015 mg/kg	[] ⁽¹⁾
2.066	[1] Spectrum No.1	-	35.763 sec]:581	ec]:581	19.D# [Count] [Linear]	Count]	[Linea								
1.0 E															
m/z->	0 F	50	30		04	0 LU		00	20	- 	O	00	100		
1.0E5															
m/z->	110	120	130		140	150	0	160	170	٣	180	190	500		
000															
<-z/ш	210	520	230		240	250		260							
rt# 58119 Lot # 071122	71122					1 of 2					Printe	Printed: 8/2/2022, 11:20:01 PM	11:20:01 P	Σ	1

Part #

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

							I Face M	lecals	Veritic	ation		- N E -	(nd/mL)						
AI	<0.02	g	<0.02	Dy	<0.02	Hf	<0.02	i.	<0.02	ïN	<0.02	Ł	<0.02	Se	<0.2	1P	<0.02	M	<000>
-	<0.02	Ca	<0.2	ם	<0.02	Ho	<0.02	Lu	<0.02	Νb	<0.02	Re	<0.02	37	<0.02	e e	<0.02	: =	<0.02
	<0.2	ပီ	<0.02	Eu	<0.02	II	<0.02	Mg	<0.01	ő	<0.02	Rh	<0.02	AP	<0.0>	F	<0.02	>	2007
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-	<0.02	ī	<0.02	Αu	<0.02	Pp	<0.02	pN	<0.02	К	F	Sc	<0.02	Ta	<0.02	Ξ	<0.02	Z	<0.02

(T)= Target analyte

Physical Characterization:

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

Certified by:

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 ($\check{+}/$ -) 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).

ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Administration of the second s	(Solvent CAS# 0 7790-69-4		Printed: 1/18/2023, 4:01:43 PM
ME	3	Actual Uncertainty. Conc. (ug/mL) +/- (ug/mL) 10000.4 20.0	۹ <u>۱</u>	
Material CI	Nitric Acid	Actual Weight (g) 100.0173		
Reference	20510011 20.0 (mL)	Target Weight (g) 100.0134		5
Certified Reference Material CRW	Solvent: Solvent: 2% 5E-05 Balance Uncertainty 0.058 Flask Uncertainty	Uncertainty Assay Purity (%) (%) 0.10 10.0	240 240 240 240 240 240 240 240 240 240	
N	5E-05 5.12 0.058	inal Purity ig/mL) (%) 00 89.899	9.619 sec]:58103. 30 130 24 14 4	
		Lot Nominal RM# Number Conc. (ug/mL) IN019 LIZ042018A1 10000	130 ²⁰ 1	
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: 57103 Lot Number: 070622 Description: Lithium (070622 Recommended Storage: Ambient (Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Compound R Lithium nitrate (Li) IN	1.0E6 [1] Spectrum No.1 5.0E5 10 m/2-> 10 250 10 m/2-> 10 10 20 m/2-> 210 m/2-> 210	

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



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

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

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-	<0.02	3	<0.02	Dy	<0.02	Hf	<0.02	E	Ŧ	N	<0.02	占	<0.02	Se	₫02	e.	<0.02	M	000>
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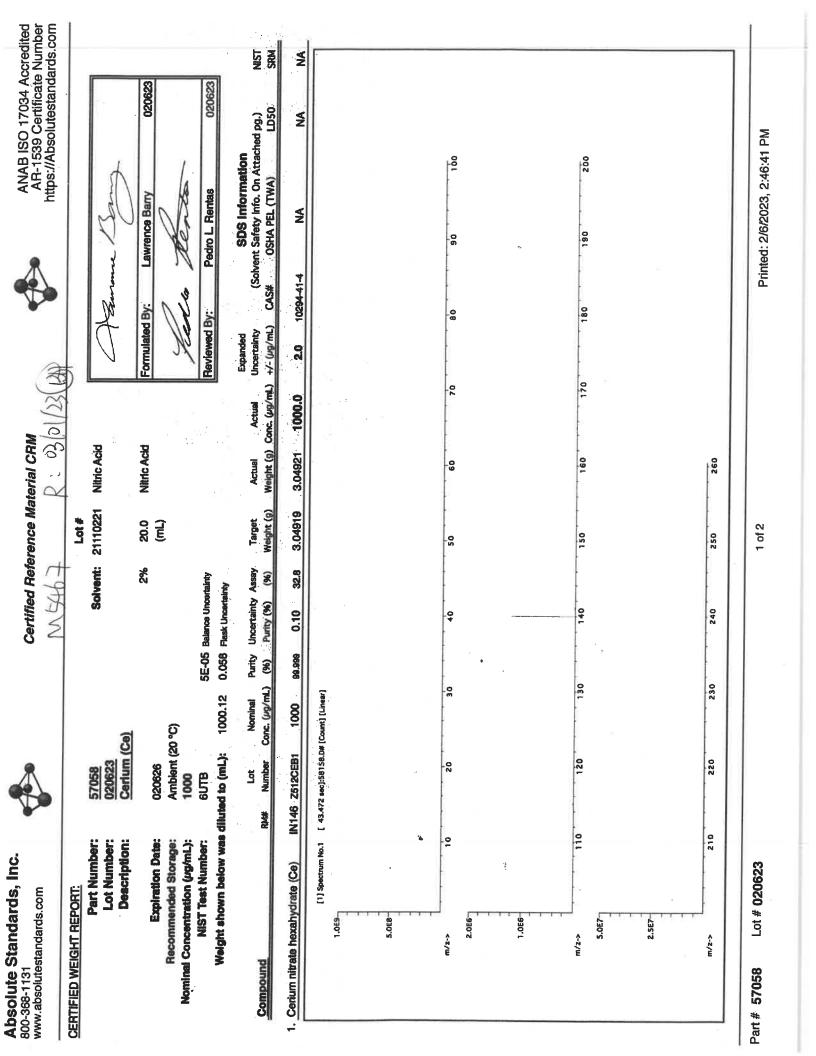
Physical Characterization:

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.
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Lot # 070622 Part # 57103



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



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

	42 Hr 488 W		<0.02 Te <0.02 U	Ag <0.02 T1 <0.02 V <0.02	<02 Th <0.02 Yb	<0.02 Tm <0.02 Y	<0.02 Sn <0.02 Zn	<0.02 Ti <0.02 Zr
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	Hf		윤	ų	Ц	Fe	La	£
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	000	20.0	20:02	4 0.2	<0.02	€0.01	<0.02	<0.02
	AI		2	As	Ba	Be	盗	P

(T)= Target analyte

Physical Characterization:

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

Certified by:

Ser P

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

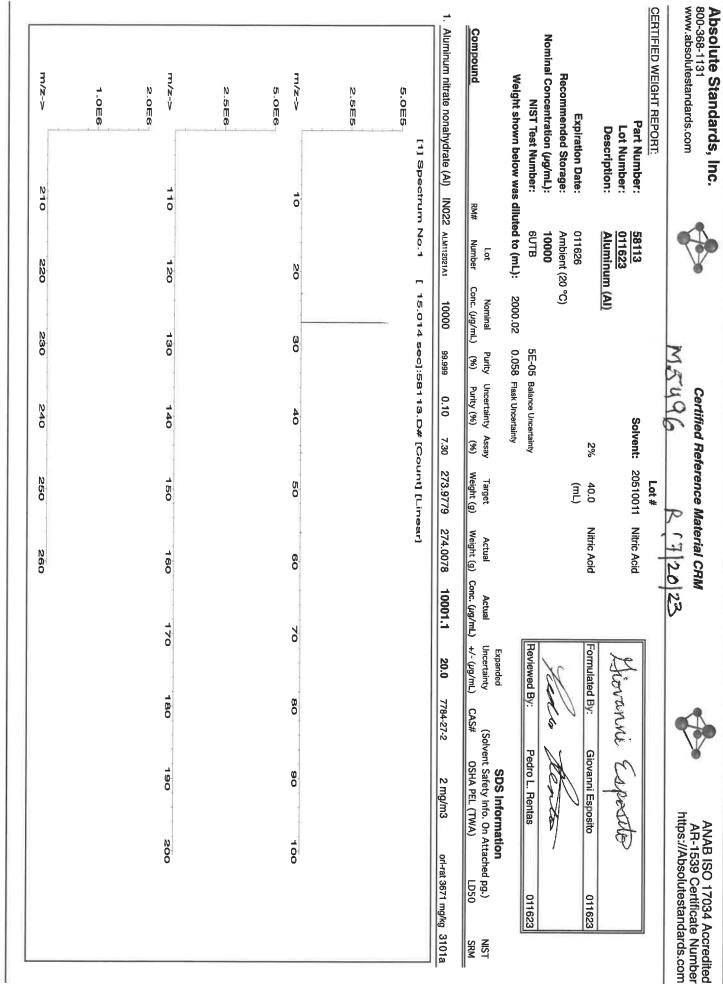
Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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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
ARA	Ped X Gio	SDS Information (Solvent Safety Info. On Attached pg.) COSHA PEL (TWA) LD5(COSHA PEL (TWA) onl-rat >2000	-0 0	190
MUXCITI	Formulated By: Reviewed By:	Expanded Uncertainty +/- (µg/mL) CAS: 20.0 471-34	Q R	170
170		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
	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):

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	<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	Sc	<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:

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Part # 58120 Lot # 031523



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

- **APPLICATION:** For use with the CLP SFAM01.0 SOW and revisions.
 - Read instructions carefully before opening bottle(s) and proceeding with M5528 ph CAUTION: the analyses.

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

> Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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

RMs ICV 1, 5, 6 SFAM (1)

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"

Instructions for QATS Reference Material: Inorganic ICV Solutions

- ICV1-1014 For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.
- **ICV5-0415** For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K₂Cr₂O₇ and 5% (v/v) nitric acid.
- **ICV6-0400** For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K₃Fe(CN)₆, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

	ICV1-1014	
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (µg/L) (after 50-fold dilution)
AI	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	2000
Mg	6000	1200
Mn	520	100
Ni	530	110
K	9900	2000
Se	1000	2000
Ag	250	
Na	10000	2000
TI	1000	210
V	500	
Zn	1000	<u>100</u>

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

m/z->	N.5 6	m/z-≯ 5.0E5	ភ. ០ ពេស	m/z-> 1.0≣6	5000	1.0트4	1. Chromium(III) nitrate nonahydrate (Cr)	Compound	Volume sho	Expiration Date: Recommended Storage: Nominal Concentration (Jug/mL):	Par De	CERTIFIED WEIGHT REPORT:	www.absolutestandards.com
N O		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

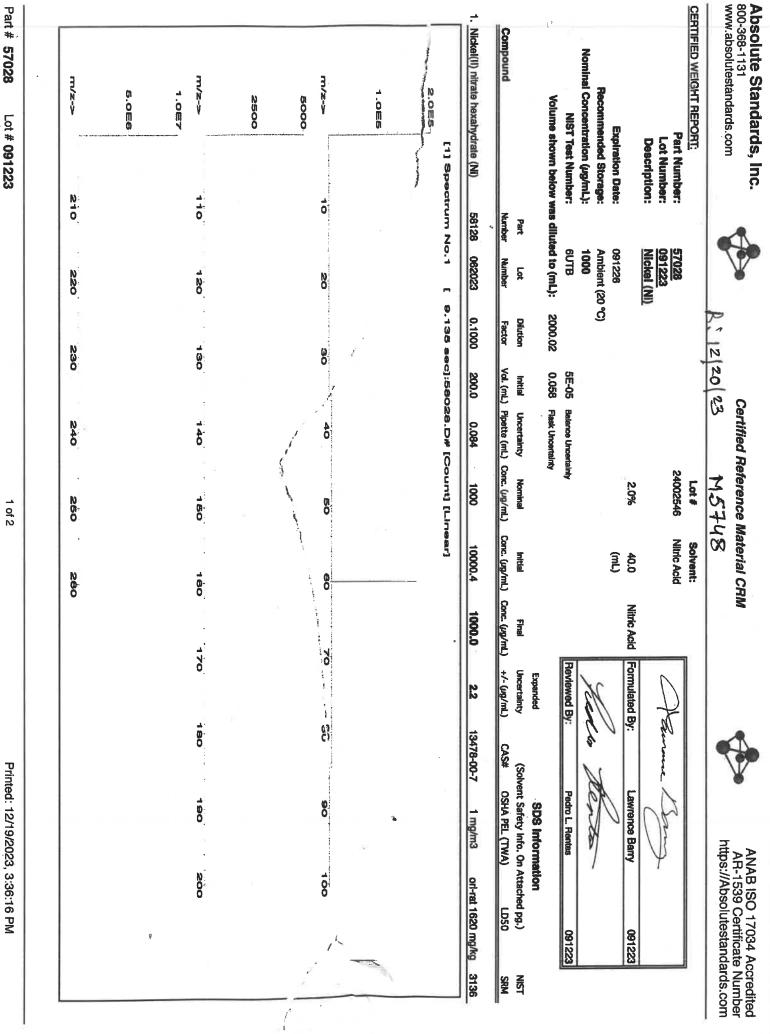
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Absolute Standards, Inc. Certified Reference 800-368-1131 Image: Certified Reference www.absolutestandards.com Image: Certified Reference Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	andards.cor	s by Indu	ictive	y 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 P	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

m/z->		2.0E6	m/z->	0.0 П 14	A)]	1.0E5	m/z->	0, 0 11 12 12 12 12 12 12 12 12 12 12 12 12	1.005	1. Lead(II) nitrate (Pb)	Compound	Weight sho	NIST 1	Recommended Storage: Nominal Concentration (µg/mL):	Exc		CERTIFIED WEIGHT REPORT:	ADSOIUTE Standards, Inc. 800-368-1131 www.absolutestandards.com
21 0 220 0			110 120				10 20		[1] Spectrum No.1 [14	IN029 PBD122016A1	Lot M RM# Number Conc	s diluted to (mL):	NIST Test Number: 6UTB		Expiration Date: 100926	Lot Number: 100923 Description: Lead (Pb)		om
230			130 140				30 40		14.144 sec]:58082.D# [Count] [Linear]	1000 93.999 0.10 62.5	Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) V	3000.41 0.06 Flask Uncertainty	5E-05 Balance Uncertainty		2%			Certified Referenc
250 260			150 160 170				50 60 70		tj [Linear]	4.80071 4.80077 1000.0	Target Actual Actual Weight (g) Weight (g) Conc. (µg/mL)			(111)	60.0 Nitric Acid	46 NITHC ACID		Certified Reference Material CRM こして、20123 Mらそれチ
			0 180 190				80 00			2.0 10099-74-8 0.05 mg/m3	Expanded SDS Informa Uncertainty (Solvent Safety Info. On +/- (µg/mL) CAS# OSHA PEL (TWA)		Reviewed By: Pedro L. Rentas	Kerten Hen	Formulated By: Lawrence Barry	Admine By		*
			2000				100			m3 intrvns-rat 83 mg/kg 3128	SDS Information (Solvent Safety Info. On Attached pg.) NIST # OSHA PEL (TWA) LD50 SRM		tas 100923	Ø	ny 100923	\¥		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

	DEFF12: 10205000					2 of 2							00923	Lot # 100923		Part # 57082
		are used in ove). 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 preparation of all standards. 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. 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).	ity raw the to Ni the Unc. (The certified value is the concentration calculated from gravimetric and volumetric measurements Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity 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 t 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 Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D	netric d the d. g and I g ffice, V	and volur assware ar vrated with wise state te laborate Printing C Printing C	s A gli re califi ropria nes foi nment	or to use. S. Gover S. Gover	ated f calibr valance t and c t, C.E. 297, U	tion calcu ed water usly clear ally using f the stat and Kuya al Note 1; al Note 1;	sentrat deioniz deioniz deioniz deioniz echnic c, B.N. h S.% o c, B.N. h i. S.% o c, B.N.h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h i. S.% o c, B.N.h h h h h h h h h h h h h h h h h h h	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	value i ion of a contain e prepa e certif keferen t Result t Result	certified preparat landard a dards ar dards ar tandards tandards suremen suremen	* The * Purifi * Stan * Stan Mea
P. S.	for the second s							ındard.	1 of this sta	paratio	xd in the pre	observe	Homogeneity: No heterogeneity was observed in the preparation of this standard.	o heterog	encity: N	Homog
Certified by:	ې ک				Vte	get anal	(T)= Target analyte						zation:	racteri	Physical Characterization:	Physi
W 40.02 V 40.02 Yb 40.02 Yb 40.02 Zn 40.02 Zn 40.02 Zn 40.02 Zn 40.02	Ть Алл 11 Алл	e 40.2 g 40.02 g 40.02 a 40.02 a 40.02 a 40.02 a 40.02 a 40.02 a 40.02	40.02 Se 40.02 Si 40.02 Ag 40.02 Ag 40.02 Na 40.02 Na 40.02 Si	Rb Sm Sm	40.02 40.02 40.02 40.02 40.02	P P R P	40.02 40.02 40.02 40.02 40.02	Hg Mg	- 40.02 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7	요 한 않 날 막 発 표	40.02 40.020	~ Co Co Co 또 편 것	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	5	40.02 40.02 40.02 40.02 40.02	Al Sb Ba Bi Bi
			(µg/mL)		by ICP-MS		Verification	Metals	Trace M							
					MS):	(ICP-	trometry	s Spe	sma Mas	ed Pla	ly Couple	uctive	Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Analy	umental	Instru
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com				CRM	Certified Reference Material C	erenc	tified Re	Ce					s, Inc.	ards.co	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	w.absolut



Part # 57028 Lot # 091223 2 of 2		 * 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). 	Homogeneity: No heterogeneity was observed in the preparation of this standard.	(T) = Target aria/vie	AI A02 Cd A02 Dy A02 H A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 C4 A02 E A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 G A02 H A02 Li A02 N A02 R A02 S A02 S A02 I A02 N A02 N <t< th=""><th>Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL)</th><th>www.absolutestandards.com</th></t<>	Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL)	www.absolutestandards.com
			et .	2	Tb 40.02 Te 40.02 TI 40.02 Th 40.02 Sn 40.02 Ti 40.02		
	5 		P. S.	Certified by:	W -0.02 U -0.02 V -0.02 Yb -0.02 Yb -0.02 Yb -0.02 Zn -0.02 Zr -0.02 Zr -0.02		AR-1539 Certificate Number https://Absolutestandards.com

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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)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number:	<u>CERTIFIED WEIGHT REPORT</u> Par Lo De	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Lot # 071723	0 0		110		10		[1] Spectrum No.		Volume shown below was diluted to (mL): Part Lot Number Number	Expiration Date: Recommended Storage: I Concentration (µg/mL): NIST Test Number:	<u>Part Number:</u> Lot Number: Description:	om
			0				, J	58129	Part Number			
	NNO		120		20		-	022723	d to (mL): Lot Number	071726 Ambient (20 °C) 1000 6UTB	58029 071723 Copper (Cu)	100
	230		130		а О		53.422 B	0.1000	2000.02 Dilution Factor	°,	(T	
			0		-		ac]:58	200.0	0.058 Initial Vol. (mL)	5E-05		
	840 040		4 0		6		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 #
			stated. used in \$7	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	
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Lot # 071723

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Certified Reference Material CRM



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							Trace M	letals	Verification	Ition	by ICP-MS		(ng/mL)							_
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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	-
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Ä	<0.02	රී	<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	-
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Physical Characterization:

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

Certified by:

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

- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
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Part # 57050 Lot #	m/z->	N.01 M.4	m/2->-	1.0E5	177/2-> 2.0E5	N G M G	8. 0 11 15	1. Ammonium hexatluorostannate(IV) (Sn)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below w	<u>CERTIFIED WEIGHT REPORT</u> Part N Lot N Desc	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
Lot # 071123	210		110 120		0 No		[1] Spectrum No.1	(W) (Sn) INO10 SND042023A1	Lot RM# Number	Expiration Date: 071126 Pecommended Storage: Ambient (20 °C) Concentration (µg/mL): 1000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	<u>PORT:</u> Part Number: <u>57050</u> Lot Number: <u>071123</u> Description: <u>Tin (Sn)</u>	s.com
	230		130		e e		[15.034 sec]:	1000	Nominal Conc. (µg/mL)	0 °C) 499.93	2	V
	20		140		ð		15.034 sec]:58150.D# [Count] [Linear]	99.999 0.10 44.2	Purity Uncertainty Assay (%) Purity (%) (%)	5E-05 Balance Uncertainty 0.058 Flask Uncertainty	Solvents:	Certific
	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.				//
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 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are 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).
 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 # 57050 Lot # 071123

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redited Jumber ds.com	NIST SRM	3113		
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Formulated By: Lawrence Barry 091923 Formulated By: Lawrence Barry 091923 Reviewed By: Pedro L. Rentas 091923 Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.) N +/- (ug/mL) CAS# 0SHA PEL (TWA) LD50 S	ng/kg	180 B0 190 200 200 200	Printed: 2/8/2024, 5:01:14 PM
AM I'U (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 Z 0 9 1 2 4	Lot # 24002546 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 Cobait (C 091926 Recommended Storage: Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): Nominal Concentration (µg/mL): NIST Test Number: COTB NIST Test Number: COTB CODAIT (C) CODAIT (C) C) CODAIT (C) C) C) C) C) C) C) C) C) C)	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							
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_	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.

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

the preparation of all standards.

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

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

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

Certified by:

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

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Certified Reference Material CRM



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

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

(T) = Target analyte

Physical Characterization:

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

Low P. S.

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 # 57033 Lot # 111323

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[Linear]	4o.1 [12.275 sec]:58105.D# [Count] [Linear]	[1] Spectrum No.1 2.0E4
11.55772 11.56201 1000.4 2.0 10043-35-3 2 mg/m3 orl-rat 2660 mg/kg	IN018 BV082016A1 1000 99.9988 0.10 17.3 11.5	1. Boric acid (B) IN018 E
Expanded SDS Information Target Actual Uncertainty (Solvent Safety Info. On Attached pg.) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50	Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%)	Compound RM#
	1000 4R	
Reviewed By: Pedro L. Rentas 071123	6UTB 5E-05 Balance Uncertainty	Nominal Concentration (µg/mL): 1 NIST Test Number: 6
40.0 Ammonium hydroxide Formulated By: Benson Chan 071123	(B) 2.0%	
Solvent: MKBC8597V Ammonium hydroxide	57005 Lo 071123	CERTIFIED WEIGHT REPORT: Part Number: 5
ce Material CRM ANAB ISO 17034 Accredited M 5종14 주가 5종14	Certified Reference Material CRM	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com



Certified Reference Material CRM



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

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

							Trace Me	tals	S Verifica	tion	by ICP-	Ś	(µg/mL)						
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	_	n (1		2 8	A	- 5		Mg	<0.01	õ	<0.02	Rh	<0.02	Ag	40.02	3	6 8 8	< 0	40.02
		다. 	A 0.02	ត្ន ខ្ល	40.02	न ⊧			20.02	3 R	40.02	R	<0.02	Na	40.2	Ţ	40.02	₽¥	<0.02
_	_	6	<0.02	ନ୍ନ	<0.02	5			3 6	7	20.02	, Ku	40.02	Sr	<0.02	Тв	<0.02	×	<0.02
		¥	<0.02	Au	<0.02	3		N a	32	4 3	<0.02	2	40.02	1 60	40.02	S	-0.02	Za	<0.02
						I		ļ			101	ą	2000	La	20.02	11	20.02	N	40.02

(T) = Target analyte

Physical Characterization:

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

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Certified by:

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. 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 #: 57005 Lot # 071123

$\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 16. D/r County (Lineau) Factor Lange Store 5mg/r 30 40 sio eo 70 sio sio sio 30 40 sio read read read read 30 40 sio read read read read read read 30 40 sio read read read	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 Status Source 1 100 27.5 72.7289 10000.0 20.0 77.27.951 Soliver Status (Solvent Status Soliver Solitive (Solvent Status 774 500 50 50 70 60 160	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	
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.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	
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		10.0>	ព្	40,02	ណ្ឌ	<0.02	놂	<0.2	Hg	40.2	שי	T	R Q	40.02	K 2	8.8 2		<0.02	4 'B	60.02 20.02	
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										(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		9	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

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
30			5 2	I She	Certified by:		MI MI<			ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

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	-	260	250	240	230		220	210	m/z->
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		ear)	ount] [Lin	24.004 sec];58116,D# [Count] [Linear]	¢ sec];58	[24.00		[1] Spectrum No.1	2000
20.0 7763-20-2 NA orf-rat 4250mg/kg 3181	10000.1	82,4682	82.4675	0.10 24.3	99,9	10000	IN117 SLBR7225V	IN1	1. Ammonium sulfate (S)
Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.) NIST +/- (ug/mL) CAS# OSHA PEL (TWA) LDSO SRM	(g) Conc. (µg/mL)	Actual Weight (g)	Target Weight (g)	Uncertainty Assay Purity (%) (%)	Purity (%)	Nominal Conc. (µg/mL)	Lot. Number	RM#	Compound
i By: Ped	[F			Balance Uncertainty Flask Uncertainty	0.058	1999.48	led to (mL):	Weight shown below was diluted to (mL):	Weight show
Lawrence barry	1 1					20 °C)	071126 Ambient (20 °C) 10000 Sum	Expiration Date: nended Storage: htration (µg/mL): %T Test Number:	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Teet Number
around Bring	Type 1 Water	ASTM Ty	Lot# 071123	Solvent:		E)	57116 071123 Sulfur (S)	<u>PORT:</u> Part Number: Lot Number: Description:	CERTIFIED WEIGHT REPORT: Part N Lot N Desc
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	CRM		ference M	Certified Reference Material	R a			om	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
								And in case of the local division of the loc	

800-368-1131 www.absolutestandards.com		0	Certified Reference Material CRM	nce Material C	RM			•	ANAB ISO 1: AR-1539 Ce https://Absolut	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	ictively Coupled	Plasma Mass Sp	ectrometry (IC	P-MS):						
		Trace Metals		Verification by ICP-MS	IS (µg/mL)					
AI <0.02 Cd <0.02	Dv 40.02	A M	-12			a dista div.	ALL MERCY		A STREET STREET STREET	
40.02 Ca		40.02	40.02 40.02	Ni <0.02 Nb <0.02	Pr <0.02 Re <0.02	Si Se				A 6.3
50 C C	Gd <0.02	In <0.02 N	Mg <0.01 C						< 0	<0.02
40.02	Ga 40.02	Fe <0.2 Hg	A A 3 12	8 8			12 1		40.02 Y 40.02	40.02 20.02
B (UUZ CI 40,02	Au <0.02	<0.02	<0.02		Sc <0.02	Ta o	<0.02		40.02 21 21 40	40.02
Physical Characterization:			(T)= Target analyte	alyte				۲ ۲	Certified by:	
Homogeneity: No heterogeneity was observed in the preparation of this standard.	oserved in the prepa	ation of this standard								1
							(the second	P.S.	
 * The certified value is the concentration calculated from gravimetric and volumetric measurements * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity in the preparation of all standards. * All standard containers are meticulously cleaned prior to use the preparation of the preparation of all standards. 	ntration calculate ionized water, ca	d from gravimetri librated Class A g	c and volumetric lassware and the	c measurement highest purity	s unless otherwise stated. raw materials are used in	ise state are used i	5.6			
* 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.	trically using bala % of the stated	value, unless othe	brated with weighwise stated.	phts traceable :	to NIST (see ab	ove).				
* Uncertainty Reference: Taylor, Measurement Result," NIST Tec	vith caps tight ar B.N. and Kuyat, (hnical Note 1297	id under appropria 2.E., "Guidelines fc , U.S. Governmen	ite laboratory co r Evaluating and t Printing Office,	I Expressing the Washington, D	⁹ Uncertainty of NIST).C. (1994).	F NIST				
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* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to * 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 Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.	itrically using bail trically using bail is of the stated with caps tight ar B.N. and Kuyat, (hnical Note 1297	prior to use. ances that are cali value, unless othe d under appropria 2.E., "Guidelines fo , U.S. Governmen	brated with weig rwise stated. re laboratory co or Evaluating and t Printing Office, t Printing Office,	ghts traceable . onditions. I Expressing the Washington, D	to NiST (see ab 3 Uncertainty o).C. (1994).	ove). F NIST				

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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
ric Acid Fic Acid Formulated By: Formulated				120		20				Lot Number							R
ric Acid Fic Acid Formulated By: Formulated	240			140		40			89.899 0.10 27.5 7.275	Purity Uncertainty Assay (%) Purity (%) (%)	0.058 Flask Uncertainty	5E-05 Balance Uncertainty					00
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Sodium Chloride, Crystal BAKER ANALYZED® A.C.S. Reagent





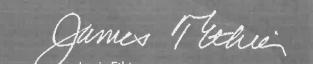


Material No.: 3624-01 Batch No.: 0000281938 Manufactured Date: 2021-06-07 Retest Date: 2026-06-07 Revision No.: 1

Certificate of Analysis

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

For Laboratory,Research,or Manufacturing Use Meets Reagent Specifications for testing USP/NF monographs Country of Origin: USA Packaging Site: Paris Mfg Ctr & DC



Jamie Ethier Vice President Global Quality

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



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA

inorganicventures.com

3.0

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:	CGY10
Lot Number:	V2-Y740548
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 μg/mL ea: Yttrium
Starting Material:	Yttrium Oxide
Starting Material Lot#:	2661 and 06230520YL
Starting Material Purity:	99.9984%
CERTIFIED VALUES AI	ND UNCERTAINTIES

Certified Value:	10000 ± 30 µg/mL
Density:	1.032 g/mL (measured at 20 \pm 4 °C)

Assay Information:

Assay Method #1	10011 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	9997 ± 50 μg/mL ICP Assay NIST SRM 3167a Lot Number: 190730
Assay Method #3	9984 ± 31 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

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

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

- X_i = mean of Assay Method I with standard uncertainty 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 $(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$ k = coverage factor = 2

- $u_{char} = [\Sigma((w_j)^2 (u_{char})^2)]^{\frac{1}{2}}$ where u_{char} are the errors from each characterization method
- ubb = bottle to bottle homogeneity standard uncertainty
- uits = long term stability standard uncertainty (storage)
- uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

- 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	<	0.004600	м	Eu		0.009037	м	Na		0.086360	M	Se	<	0.005200	м	Zn		0.030125
	-	-												-					
М	AI		0.014862	0	Fe		0.002410	M	Nb	<	0.000570	U	Si		0.024100	0	Zr	<	0.002600
М	As	<	0.003500	М	Ga	<	0.000570	М	Nd		0.000923	M	Sm		0.000461				
М	Au	<	0.001700	М	Gd	<	0.003500	М	Ni	<	0.005700	М	Sn	<	0.002300				
0	в		0.002209	М	Ge	<	0.005200	М	Os	<	0.001200	М	Sr	<	0.004600				
0	Ва	<	0.002500	М	Hf	<	0.000570	n	Ρ	<		М	Та	<	0.000570				
0	Ве	<	0.001400	М	Hg	<	0.000570	М	Pb		0.005020	М	Tb		0.001044				
М	Bi	<	0.003500	М	Но		0.009037	М	Pd	<	0.005100	М	Те	<	0.002300				
0	Са		0.009841	М	In	<	0.002300	М	Pr	<	0.002300	М	Th	<	0.000570				
М	Cd	<	0.000570	М	Ir	<	0.000570	М	Pt	<	0.000570	М	Ti	<	0.003500				
М	Се	<	0.002300	0	к		0.018677	М	Rb	<	0.000570	М	TI	<	0.000570				
М	Co	<	0.000570	М	La		0.000461	М	Re	<	0.000570	М	Tm	<	0.003500				
М	Cr	<	0.004000	0	Li	<	0.009300	М	Rh	<	0.008000	М	U	<	0.000570				
М	Cs	<	0.000570	M	Lu		0.000582	М	Ru	<	0.000570	Μ	v		0.001265				
М	Сц		0.002610	0	Mg		0.001486	n	S	<		М	W	<	0.002300				
М	Dy		0.003815	M	Мп		0.000582	М	Sb		0.005422	s	Y	<					
М	Er		0.003615	М	Мо	<	0.005700	М	Sc	<	0.001200	Μ	Yb		0.001827				

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

6.0 INTENDED USE

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

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale</u>. <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 Welght; Valence; Coordination Number; Chemical Form in Solution - 88.91 +3 6 Y(OH)(H2O)x+2 Chemical Compatibility -Soluble in HCI, H2SO4 and HNO3. Avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.

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

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

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

Estimated D.L.	Order	Interferences (underlined indicates severe)
0.8 ppt	N/A	73Ge16O, 178Hf+2
0.005 / 0.000036 µg/mL	1	Ce, Th
0.004 / 0.00007 µg/mL	1	Ce
0.005 / 0.0009 µg/mL	1	Ta, Th
	0.8 ppt 0.005 / 0.000036 µg/mL 0.004 / 0.00007 µg/mL	0.8 ppt N/A 0.005 / 0.000036 μg/mL 1 0.004 / 0.00007 μg/mL 1

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 20, 2024

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

11.2 Lot Expiration Date

- February 20, 2029

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

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

Uyen Truong **Custom Processing Supervisor**

Certificate Approved By:

Muzzammil Khan Stock Laboratory Supervisor

Mayn Mung Mayni Kh Paul R Laina

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

	m/z-> 210	1.0E8	N. O E B	m/z-≻ 110	-1 -0 	m/z-> 10 2.0E8	1.0 [[]	[1] Spectrum No.1 2.0E4	1. Selenium (Se)	Compound	Volume shown below was diluted to (mL):	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	Lot Number: Description:	CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
	0			0		J.		um No	58134	Part Number	6 as diluted			л	
220				120		12 0		-	071223	Lot Number	ed to (mL):	060627 Ambient (20 °C) 1000	<u>060624</u> Selenium (Se)	7024	V
	N			4		ω		33.702	0.1000	Dilution Factor	2000.07	ĉ	(Se)		
	230			130		80		90C]:58	200.0	Initial Vol. (mL)	5E-05 0.100				
	240			140		4 0		034.D#	0.084	Initial Uncertainty Vol. (mL) Pipette (mL)	Balance Uncertainty Flask Uncertainty				Sertified Referen
	250			150		. (л О		33.702 sec]:58034.D# [Count] [Linear]	1000	Nominal Conc. (µg/mL)	rtainty nty		2.0%	Lot #	Reference 162.
	260			160		60		inear]	10002.5	Initial Conc. (µg/mL)		(mL)	40.0	Solvent:	Certified Reference Material CRM からすチェート・アンの
				170		70			1000.0	Final Conc. (ug/mL)	11		Nitric Acid		114
				ŏ		0			2.2	Expanded Uncertainty +/- (µg/mL)	Reviewed By:	<i>M</i>	Formulated By:		24
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				190		90			0.2 mg/m3	SDS Information nt Safety Info. On Att: OSHA PEL (TWA)	Pedro L. Rentas		Benson Chan		ਤ
				200		100			3 orl-rat 6700 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) AS# OSHA PEL (TWA) LDS0	1tas 060624	,	n 060624		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com		₽M	terial Cl	nce Ma	Certified Reference Material CRM	Certifie					Inc.		Absolute Standards, 800-368-1131 www.absolutestandards.com	Absolute 800-368-1131 www.absolute	800-



Part# 57003 Lot # 062124	 * The certified value is the concentration calculated from gravimetric and volumer * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and 1 the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravinetrically using balances that are calibrated with w * Standards are certified (+/) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate iaboratory * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating of Measurement Result," NIST Technical Note 1297, U.S. Government Printing Off 	Homogeneity: No heterogeneity was observed in the preparation of this standard.	Physical Characterization:	Al 40.02 Cid 40.02 Dry 40.02 Hd Sb 40.02 Cic 40.02 Eu 40.02 Hd As 40.2 Cic 40.02 Eu 40.02 In Ba 40.02 Cic 40.02 Gd 40.02 In Bi 40.02 Cic 40.02 Ge 40.02 In Bi 40.02 Cic 40.02 Ge 40.02 La		Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	Absolute Standards, Inc. 800-368-1131 www.absolutiestandards.com
2 01 2	 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standard. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * 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. * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards broud by stoud with cases tight and under appropriate laboratory conditions. * All Standards are prepared with cases tight and under appropriate laboratory conditions. * Missing the Uncertainty of NIST * All Standards Wissing the Uncertainty of NIST was a stated with the stated of the stated value, unless otherwise stated. * All Standards Wissing the Uncertainty of NIST * Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	this standard.		40/02 Li T Nh 40/02 Hr 40/02 And 40/02 Li An	-MS (µg/mL)	Mass Spectrometry (ICP-MS):	Certified Reference Material CRM
Printed: 6/24/2024, 11:20:08 PM	Ъ.	Sur P. S.	Certified by:	Site Gall Tite Gall U Gall Site Gall Tite Gall Site Gall Si			ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

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Z = 1000BL = $\sup_{x \in \mathcal{A}} (\pi_x) = O_{CRM/RM} = k \left(u^2_{Char} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{T}_{bb} + u^2_{C}_{bb} \right)^{1/2}$ $\mathsf{M}^{i} = (1/\mathsf{n}^{\mathsf{clust}\,i})^{\Sigma} \setminus (\Sigma(1/(\mathsf{n}^{\mathsf{clust}\,i})_{\Sigma})$

nieneity standard uncertain ucherts mort arone enti = a fanta lisnegomort ettod,ot ettod = dd^u adnere vitidats mot gnot = _{ad}t $\label{eq:spinor} \min \left\{ x \right\} = U_{CRM/RM} = k \left\{ u^2_{char} * u^2_{bb} + u^2_{bb} + u^2_{bb} + u^2_{bb} \right\}^{4}$

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

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

Certified Value, X_{CRMRM}, 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

F# bodteM vssA

g = Jojoej

un pepuedra w

(1x) (1w) = X(wi) (xi)

: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 tothe weighting actions for each method with the standard uncertainty updat 1

CERTIFIED VALUES AND UNCERTAINTIES 3.0

Starting Material Purity: 99.9975% Starting Material Lot#: 2094 Starting Material: In Metal unineti T 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 Manuel 2014) 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 6657 'SLEST

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 approximated as 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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792600.0	>	uΖ	0 \$	0.00120		92	Μ	0.032670	>	вN	0	0.000268	>	nΞ	Μ	0.000536	>	₿¥	M

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 second and the Competence of the Competence of Testing and Calibration Laboratories."

- QSR Certificate Number QSR-1034

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WOITATNEMUDOD GRADNATS YTILAUD

0.01

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

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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 Ibraham and Ferdina) and a solution - powder reacts

HINGS / LOPE corporations of an LOPE contained, while all solutions as the TI(F)6-2 chemically stable for years in HNOS / Lope container. 1-10,000 ppm single element solutions as the TI(F)6-2 chemically stable for years in TI Containing American and Solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 1-Metal (Solution in 2000) the solution and Solutions are the TI(F)6-2 chemically stable for years in 1.000 ppm single element solutions. 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 Mixaline or Rare 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 ordent of the ordent 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 the rescaled to the test to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss. - While stored in the sealed TCT bag, transpiration of this 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

NOS Paulo 182

Paul Gaines

-

Thomas Kozikowski Manager, Quality Control

Certificate Approved By:

0.2r

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; 640,585,3030, Fax: 540,562,5015; Innga

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

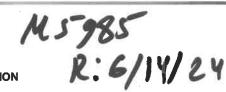
10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"



Certificate of Analysis

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



2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGIN10
Lot Number:	U2-IN729349
Matrix:	5% (v/v) HNO3
Value / Analyte(s):	10 000 μg/mL ea: Indium
Starting Material:	Indium Metal
Starting Material Lot#:	2511
Starting Material Purity:	99.9995%
CERTIFIED VALUES AN	ID UNCERTAINTIES

Certified Value:	10022 ± 30 μg/mL
Density:	1.044 g/mL (measured at 20 \pm 4 °C)

Assay Information:

3.0

Assay Method #1	10021 ± 56 μg/mL ICP Assay NIST SRM 3124a Lot Number: 110516
Assay Method #2	10035 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10001 ± 33 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

- $\begin{array}{l} \text{construction} \quad \text{con$
- 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:

$$\begin{split} \chi_{CRM/RM} = (X_n) \, (u_{cher\ n}) \\ \chi_n = mean\ of\ Assay\ Method\ A\ with \\ u_{cher\ n} = the\ standard\ uncertainty\ of\ characterization\ Method\ A \end{split}$$

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²_{cher} a + u²_{bb} + u²_{Hs} + u²_{ts})^½ k = coverage factor = 2 u_{char} a = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty u_{fts} = long term stability standard uncertainty (storage) u_{tt} = 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	<	0.000760	Μ	Eu	<	0.000760	0	Na		0.012771	М	Se	<	0.023000	М	Zn	<	0.006100
М	AI		0.003385	0	Fe		0.004462	М	Nb	<	0.000760	0	Si		0.024619	М	Zr	<	0.000760
М	As	<	0.004600	М	Ga	<	0.000760	М	Nd	<	0.000760	М	Sm	<	0.000760				
М	Au	<	0.002300	М	Gd	<	0.000760	0	Ni	<	0.005100	М	Sn	<	0.000760				
0	в		0.003692	М	Ge	<	0.001600	м	Os	<	0.000760	0	Sr	<	0.000610				
М	Ba	<	0.001600	М	Hf	<	0.000760	n	Р	<		М	Та	<	0.000760				
0	Be	<	0.000130	М	Hg	<	0.003100	М	Pb		0.001400	М	Tb	<	0.000760				
Μ	Bi	<	0.000760	М	Ho	<	0.000760	Μ	Pd	<	0.001600	М	Те	<	0.000760				
0	Ca		0.004616	5	In	<		М	Pr	<	0.000760	М	Th	<	0.000760				
М	Cd	<	0.000760	М	lr –	<	0.000760	М	Pt	<	0.000760	0	Π	<	0.001100				
М	Се	<	0.000760	0	к		0.007078	М	Rb	<	0.000760	М	TI	<	0.000760				
М	Со	<	0.000760	М	La	<	0.000760	М	Re	<	0.000760	M	Tm	<	0.000760				
0	Cr	<	0.001300	0	Li	<	0.000130	М	Rh	<	0.000760	м	U	<	0.000760				
М	Cs	<	0.000760	М	Lu	<	0.000760	М	Ru	<	0.000760	М	V	<	0.001600				
М	Cu	<	0.003800	0	Mg		0.000707	n	s	<		М	W	<	0.001600				
М	Dy	<	0.000760	0	Mn		0.000149	М	Sb	<	0.000760	М	Y	<	0.000760				
М	Er	<	0.000760	М	Мо	<	0.002300	М	Sc	<	0.000760	М	Yb	<	0.000760				

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

6.0 INTENDED USE

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

In Containing Samples (Preparation and Solution) -Metal (Best dissolved in HCI / HNO3); Oxide (Soluble in mineral acids); Ores (Carbonate fusion in Pt0 followed by HCI dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in dilute 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 115 amu	1 ppt	n/a	115Sn, 99Ru16O
ICP-OES 158.583 nm	0.05 / 0.002 µg/mL	1	
ICP-OES 230.606 nm	0.1 / 0.03 µg/mL	1	Ni, Os
ICP-OES 325.609 nm	0.2 / 0.05 µg/mL	1	Mn, Mo, Th

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 21, 2023

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

11.2 Lot Expiration Date

- February 21, 2028

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

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

11.3 Period of Validity

- 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

DJ 78

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Sulfuric Acid BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis

Low Selenium

W form - Np





Material No.: 9673-33 Batch No.: 23D2462010 Manufactured Date: 2023-03-22 Retest Date: 2028-03-20 **Revision No.: 0**

Certificate of Analysis

Test	Specification	Result
ACS – Assay (H2SO4)	95.0 - 98.0 %	96.1 %
Appearance	Passes Test	Passes Test
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Substances Reducing Permanganate (as SO2)	≤ 2 ppm	< 2 ppm
Ammonium (NH4)	≤ 1 ppm	1 ppm
Chloride (Cl)	≤ 0.1 ppm	< 0.1 ppm
Nitrate (NO3)	≤ 0.2 ppm	< 0.1 ppm
Phosphate (PO4)	≤ 0.5 ppm	< 0.1 ppm
Trace Impurities – Aluminum (Al)	≤ 30.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 4.0 ppb	< 2.0 ppb
Trace Impurities – Boron (B)	≤ 10.0 ppb	8.5 ppb
Trace Impurities – Cadmium (Cd)	≤ 2.0 ppb	< 0.3 ppb
Trace Impurities – Chromium (Cr)	≤ 6.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 0.5 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities - Gold (Au)	≤ 10.0 ppb	0.5 ppb
Heavy Metals (as Pb)	≤ 500.0 ppb	< 100.0 ppb
Trace Impurities – Iron (Fe)	≤ 50.0 ppb	1.3 ppb
Trace Impurities - Lead (Pb)	≤ 0.5 ppb	< 0.5 ppb
Trace Impurities – Magnesium (Mg)	≤ 7.0 ppb	0.8 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities – Nickel (Ni)	≤ 2.0 ppb	0.3 ppb
Trace Impurities – Potassium (K)	≤ 500.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se)	≤ 50.0 ppb	< 0.1 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	31.5 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb

>>> Continued on page 2 >>>

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



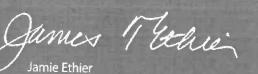


Material No.: 9673-33 Batch No.: 23D2462010

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

For Laboratory, Research, or Manufacturing Use

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



C10 30C 1300

Jamie Ethier Vice President Global Quality

1.0



Certificate of Analysis MGO 7Y

M6075 M6076

M6077

300 Technology Drive Christiansburg, VA 24073 USA 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).

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





2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custom Grade Solution	
Catalog Number:	CHEM-CLP-4	
Lot Number:	V2-MEB746762	
Matrix:	3% (v/v) HNO3 3% (v/v) HF	
Value / Analyte(s):	1 000 µg/mL ea:	Molubdopum
	Boron,	Molybdenum,
	Silicon,	Tin,
	Titanium	

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 5 µg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 5 µg/mL
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 5 μg/mL
Titanium, Ti	1 000 ± 6 µg/mL		
Density:	1.033 g/mL (measur	ed at 20 ± 4 °C)	
Assay Information:			

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

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

Characterization of CRM/RM by Two or More Methods

Certified Value, X_{CRW/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_j = 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 $(u^2_{cher} + u^2_{bb} + u^2_{ts} + u^2_{ts})^{1/2}$ k = coverage factor = 2

- $u_{char} = \left[\sum ((w_i)^2 (u_{char})^2) \right]^{\frac{1}{2}}$ where u_{char} i are the errors from each characterization method
- ubb = bottle to bottle homogeneity standard uncertainty
- ults = long term stability standard uncertainty (storage)
- uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

u_{ts} = 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

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

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

- For more information, visit www.inorganicventures.com/TCT HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669,6799; 540.585.3030, Fax: 540.585,3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 06, 2024

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

11.2 Lot Expiration Date

- September 06, 2029

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

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

- 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:

Joseph Burns **Custom VS Manager**

Paul R Saines

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director





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 (Al)	≤ 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 Nitric Acid Magnesium (Mg) N.S. I/I/3/250/vent: 24012496 Nitric Acid 112127 N.J. V.Y. 2% 40.0 Nitric Acid 112127 M. V.Y. 2% 40.0 Nitric Acid 112127 M. V.Y. 2% 40.0 Nitric Acid 110000 SE-05 Balance Uncertainty SE-05 Balance Uncertainty	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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40.02 Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se 40.2 Th 40.02 W 40.02 Ca 40.2 Er 40.02 Hf 40.02 Li 40.02 Pr 40.02 Se 40.2 Th 40.02 W 40.02 Ca 40.2 Er 40.02 Ha 40.02 Nb 40.02 Re 40.02 Si 40.02 T 40.02 V 40.02 V	40.02 Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se 40.2 Tb 40.02 W 40.02 Ca 40.2 Er 40.02 Hf 40.02 Li 40.02 N 40.02 Se 40.2 Tb 40.02 U 40.02 Ca 40.02 Hr 40.02 Li 40.02 Nb 40.02 Se 40.2 Tb 40.02 U 40.02 Ca 40.02 Hr 40.02 Mg T 0s 40.02 Rb 40.02 Tb 40.02 U 40.02 Ca 40.02 In 40.02 Mg T 0s 40.02 Rb 40.02 Tb 40.02 V 40.02 Ca 40.02 In 40.02 Mg T 0s 40.02 Rb 40.02 Tb 40.02 V 40.02 Fin 40.02 Mg T 0s 40.02 Rb 40.02	. 6	IO	20.02	10	40.2	Næ	<0.02	Rb	<0.02	Pd	<0.02	Mn	<0.02	ŀ	<0.02	R	<0.02	S	<0.02	Ba
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		4	W	40.02	7	c (b)	S	and	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
								g 3132	NIST	<u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>		Accredited e Number Jards.com

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





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

Г							Trace Mo	etals	Verifica	ition	by ICP-	Ś	(µg/mL)						
	3	2	2000		5		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	RJ.	<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

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* All standard containers are meticulously cleaned prior to use.

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

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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 # 58025 Lot # 101124

Part # 58111 Lot # 072424	m/z->	N. Un M	m/z->	א. ה ס	5.0E6	N 51 11 63	5.0E5	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 Number: Lot Number:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
424	210 220		110 120		1 ง ง		[1] Spectrum No.1	IN036 NAV01201511 1	RM# Lot N	Sodium (Na 072427 Ambient (20 ° 10000 6UTB s diluted to (mL):	a a ·	Inc.
	230 240		130 140		ల ర		8.935 sec]:58111.D# [Count] [Linear]	10000 99.999 0.10 26.9	Nominal Purity Uncertainty Assay Conc. (ug/mL) (%) Purity (%) (%)	レ WM ら 1 4 4 2% C) SE-05 Balance Uncertainty 4000.2 0.10 Flask Uncertainty	R-> 1/13/2_Solvent:	Certified Re
1 of 2	250 260		150 160 1		50 60		unt] [Linear]	148.7096 ###### 10000.0	Target Actual Actual Weight (g) Weight (g) Conc. (µg/mL)	80.0 Nitric Acid (mL)	Lot # 24002546 Nitric Acid	Certified Reference Material CRM
Printed: 1/10/2025, 4:48:22 PM			170 180 190 200		70 80 90 100			20.0 7631-99-4 5 mg/m3 or	Expanded SDS Information Uncertainty (Solvent Safety Info. On Attached pg.) .) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50	Formulated By: Benson Chan	M	ANAB I AR-15: https://Ak
22 PM								orl-rat 3430 mg/kg 3152a	IChed pg.) NIST LD50 SRM	072424 072424		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com

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



Certified Reference Material CRM



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

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

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Physical Characterization:

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In P. St.

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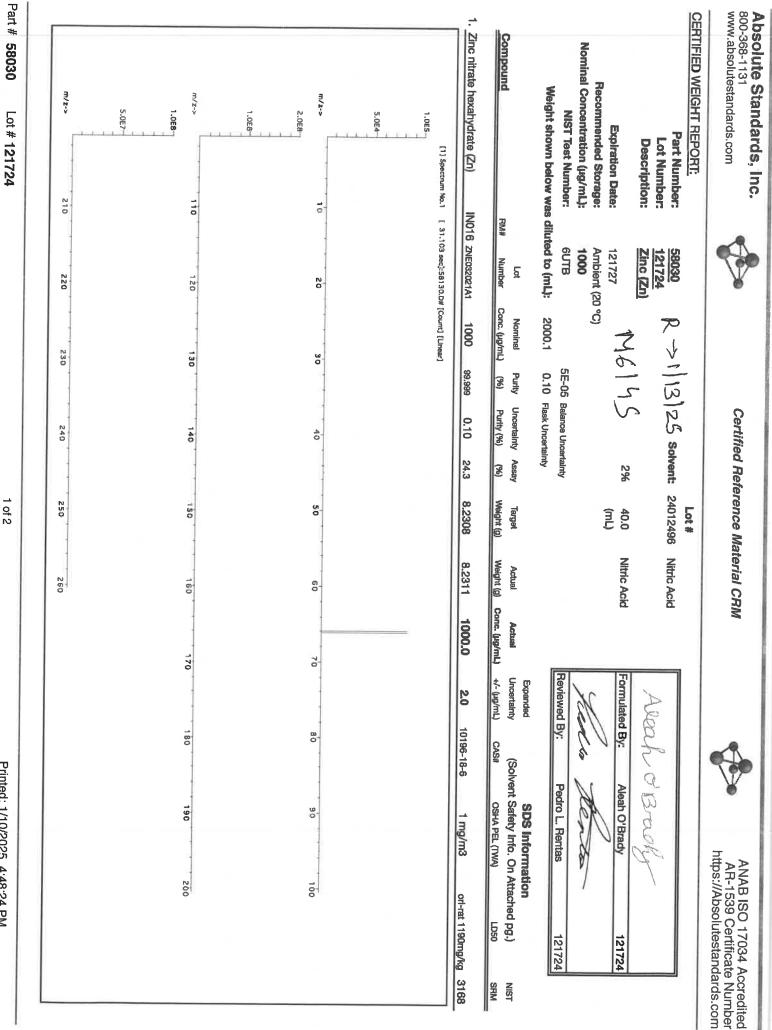
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1 of 2

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





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

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

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(T) = Target analyte

Physical Characterization:

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Part # 58030 Lot # 121724



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

16150

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

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

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

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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

RMs ICV 1, 5, 6 SFAM.docx

Page 1 of 2

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



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



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

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

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

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

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

	ICV5-0415	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

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





M6151

R-> 1/15/25

Material No.: 9530-33 Batch No.: 22G2862015 Manufactured Date: 2022-06-15 Retest Date: 2027-06-14 Revision No.: 0

Certificate of Analysis

Test	Specification	D. L.
ACS - Assay (as HCI) (by acid-base titrn)		Result
ACS - Color (APHA)	36.5 - 38.0 %	37.9 %
ACS - Residue after Ignition	≤ 10	5
ACS - Specific Gravity at 60°/60°F	≤ 3 ppm	< 1 ppm
ACS – Bromide (Br)	1.185 - 1.192	1.191
ACS - Extractable Organic Substances	≤ 0.005 %	< 0.005 %
ACS – Free Chlorine (as Cl ₂)	≤ 5 ppm	< 1 ppm
Phosphate (PO4)	≤ 0.5 ppm	< 0.5 ppm
Sulfate (SO4)	≤ 0.05 ppm	< 0.03 ppm
Sulfite (SO3)	≤ 0.5 ppm	< 0.3 ppm
Ammonium (NH4)	≤ 0.8 ppm	0.3 ppm
Trace Impurities - Arsenic (As)	≤ 3 ppm	< 1 ppm
Trace Impurities - Aluminum (Al)	≤ 0.010 ppm	< 0.003 ppm
Arsenic and Antimony (as As)	≤ 10.0 ppb	1.3 ppb
Trace Impurities – Barium (Ba)	≤ 5.0 ppb	< 3.0 ppb
	≤ 1.0 ppb	0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	163.0 ppb
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	0.7 ppb
Trace Impurities - Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities - Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	≤ 4.0 ppb	0.6 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	6 ppb

>>> Continued on page 2 >>>

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





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

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

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



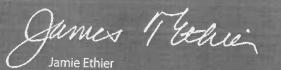


Material No.: 9530-33 Batch No.: 22G2862015

Test	Specification	Result

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

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



Vice President Global Quality

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

Part # 57047 Lot # 122823

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	THE WAY DOWN	State of	12.12.2.2016	18 - ¹ 19			The state of the state		1.40 . 10 . 10 . 10 E	No.		No.			
A	<0.02	8	<0.02	Dy	<0.02	Hf	<0.02	5	<0.02	N	<0.02	7	<0.02	Se	<0.2	ТЪ	<0.02	W	<0.02
Sb	<0.02	ß	<0.2	막	40.02	Но	<0.02	Lu	<0.02	ĥ	<0.02	Re	<0.02	<u>8</u>	<0.02	Te	40.02	q	<0.02
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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
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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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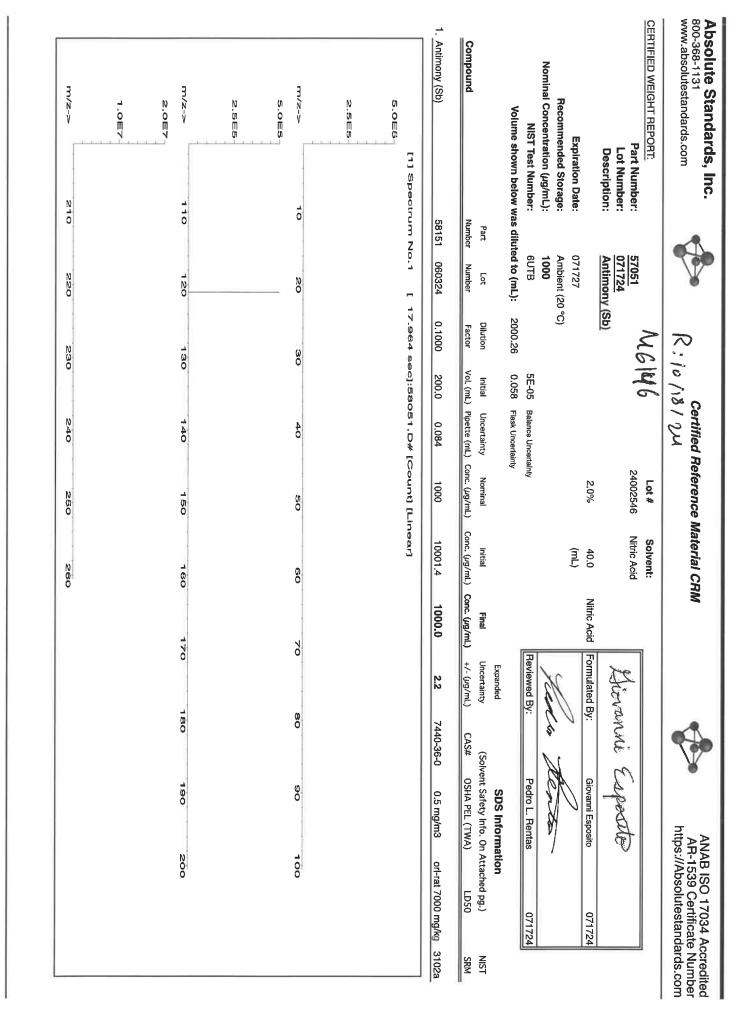
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Certified Reference Material CRM



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				
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Pb	La	Fe	ŀ	μ	Ho	Hf			
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K	Pt	P	Pd	°s	ĥ	Ni		tion	
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Sc	Sm	 40.02 Pr 40.02 Re 40.02 Rh 40.02 80 		in) SI					
<0.02	<0.02	<0.02	Pr Re <0.02 Rh <0.02 Rh <0.02 Rb <0.02 Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb <0.02 Cl Rb Cl Rb Cl Rb Cl Rb Cl Rb Cl Rb Cl Rb Cl Rb Cl Rb Cl Rb Rb Cl Rb Rb Rb Rb Rb Rb Rb Rb Rb Rb		g/mL)				
Ta	s	Sr	Na	Ag	Si	Se			
<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2			
T	Sn	Tm	Τħ	T	Te	Τb			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
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

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

QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "msycore Certified Program"



Instructions for QATS Reference Material: ICP-AES ICS

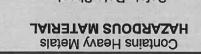
QATS LABORATORY INORGANIC REFERENCE MATERIAL INTERFERENCE CHECK SAMPLE SET FOR ICP-AES (ICSA WITH ICSB)

NOTE: These instructions are for advisory purposes only. If any apparent conflict exists between these instructions.

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

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

7519H



Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

Page 1 of 2

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

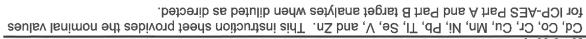


The Quality Assurance Technical Support (QATS) contract is operated by APTIM Federal Services, LLC.

202-71-10 ,10/981-1700-02 mio-1 2TAO

"msrgor9 beiitithe0 &t02:1000 OSI nA" **Ουλιτή Assurance technical support laboratory**





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

dilute to volume with 2% v/v HNO₃. Analyze this ICSA solution by ICP-AES. ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and

.23A-93 vd noitulos 8A231 sidt 92vlsnA .50VH and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution

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

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

		0120-85	XED WITH IC	IM FIST-AS			
HgiH timiJ Algu	woJ Low Low	Part A +Part B (µg/L)	(hgiH) timit (L)(L)	woJ Low Low	Part A (µg/L)	כצסר	tnemel
282000	509000	247000	594000	216000	522000	200	IA
111	929	819	0.03	0.08-	(0.0)	09	qs
120	88.4	104	0.01	0.01-	(0.0)	01	sA
737	285	(283)	506	±61-	(0.8)	500	Ba
029	450	462	0.8	0.8-	(0.0)	0.8	Be
1150	826	726	0.9	0.1-	(0.1)	0.8	Cq
271000	166000	532000	282000	208000	545000	2000	вЭ
624	400	242	62.0	45.0	(52.0)	01	Cr
248	404	924	20.0	-20.0	(0.0)	90	0 <u>)</u>
588	434	211	27.0	-53.0	(0.2)	52	ng
114200	84400	00266	116500	00958	101000	100	Fe
0.68	39.0	(0.94)	0.01	0.01-	(0.0)	10	ЪР
286000	210000	548000	594000	216000	265000	2000	бM
5 84	430	209	22.0	0.8-	(0.7)	91	uM
0011	810	964	45.0	-38.0	(0.2)	40	!N
0.18	0.11	(0.94)	36.0	-32'0	(0.0)	32	əS
532	021	201	0.01	0.01-	(0.0)	10	бĄ
133	83.0	(801)	55.0	-25.0	(0.0)	52	L IL
295	417	461	20.0	-20'0	(0.0)	90	Λ
9001	608	652	0.08	0.08-		09	l uZ

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211,

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

0.08-

(0.0)

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Page 2 of 2

608

9601

796

0.00

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Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

Contains Heavy Metals HAZARDOUS MATERIAL Safety Data Sheets

Available Upon Request

M6155

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

Page 1 of 2

RMICP-AES ICSA-1211 B-0710 SFAM.docx

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



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



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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO₃. Analyze this ICSAB solution by ICP-AES.

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

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

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

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



Certificate of Analysis

R: 8/5/24 M6019

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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

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

Assay Information:

3.0

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

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

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

4.0 TRACEABILITY TO NIST

Characterization of CRM/RM by One Method

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

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

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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	Μ	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

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.

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Certified by:

* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. 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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Part # 57081 Lot # 062724

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
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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						j.		•
21		Alla	Formulated By:	M	Reviewed By:		Expanded		2.2			70			170		
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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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Part # 57023 Lot # 062424





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

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Physical Characterization:

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

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Certified by:

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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.

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