

8900, Fax: 908 789 8922

# **Prep Standard - Chemical Standard Summary**

Order ID: P4522

Test: Metals CLP MS FULL

Prepbatch ID: PB164585,

Sequence ID/Qc Batch ID: LB133264,

## Standard ID:

MP81119, MP82127, MP82583, MP83014, MP83016, MP83032, MP83033, MP83034, MP83035, MP83036, MP83037, MP83038, MP83039, MP83041, MP83042, MP83043, MP83044, MP83048, MP83049, MP83050, MP83071,

## Chemical ID:

M5192, M5288, M5289, M5294, M5304, M5390, M5476, M5498, M5513, M5515, M5519, M5565, M5634, M5657, M5658, M5697, M5698, M5739, M5751, M5769, M5799, M5800, M5801, M5802, M5806, M5815, M5816, M5817, M5818, M5819, M5820, M5873, M5874, M5935, M5961, M5962, M5976, M5978, M5981, M5982, M5983, M6021, M6023, M6025, M6028, M6030, M6037, M6040, M6055, M6095, M6113, M6115, W2606, W3112,



 $284 \; Sheffield \; Street, \; Mountainside, \; New \; Jersey \; 07092, \; Phone \; : \; 908 \; 789 \; 8900, \\$ 

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# **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By	
169	1:1HNO3		06/21/2024			METALS_SCA	' <u>-</u>	Sarabjit Jaswal	
						LE_2 (M SC-2)	ETTE_1 (ICP	06/21/2024	
FDOM	A)  1250 00000ml of M5025 ± 1250 00000ml of W2606 = Final Quantity: 2500 000 ml								

<u>FROM</u>	1250.00000ml of M5935 -	1250.00000mi of W2606	= Final Quantity: 2500.000	mı

Recipe	NAME	No	D D.4.	Expiration	<u>Prepared</u>	0 1 - 10	Disc. 44 - ID	Supervised By
<u>ID</u> 170	NAME 1:1HCL	NO. MP82127	Prep Date 09/03/2024	<u>Date</u> 02/08/2025	<u><b>By</b></u> Janvi Patel	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
								09/03/2024

**FROM** 1250.00000ml of M6040 + 1250.00000ml of W3112 = Final Quantity: 2500.000 ml



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# Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME.	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3964	CONC.LCSS SPIKE	MP82583	09/28/2024	10/31/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	09/30/2024

**FROM** 

0.25000 ml of M5698 + 0.25000 ml of M5798 + 0.25000 ml of M5800 + 0.25000 ml of M5801 + 0.25000 ml of M5961 + 0.25000 ml of M5981 + 0.25000 ml of M5982 + 0.25000 ml of M5983 + 0.25000 ml of M6023 + 0.25000 ml of M6025 + 0.25000 ml of M6028 + 0.25000 ml of M6030 + 0.50000 ml of M5289 + 0.50000 ml of M5658 + 0.50000 ml of M5697 + 0.50000 ml of M5802 + 1.25000 ml of M5799 + 1.25000 ml of M5819 + 1.25000 ml of M5962 + 1.25000 ml of M6021 + 12.50000 ml of M5799 + 12.50000 ml of M5769 + 12.50000 ml of M5806 + 158.75000 ml of M3112 + 2.50000 ml of M5390 + 2.50000 ml of M5818 + 2.50000 ml of M6040 + 5.00000 ml of M5515 + 5.00000 ml of M6037 + 6.25000 ml of M5816 + 6.25000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By  Mohan Bera
1122	ICPMS CALIB BLANK(S0/ICB/CCB)	MP83014	11/02/2024	11/25/2024	Sarabjit Jaswal	None	None	11/04/2024

FROM 25.00000ml of M6095 + 4925.00000ml of W3112 + 50.00000ml of M6115 = Final Quantity: 5000.000 ml



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# Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
2902	S8 ICPMS	MP83016	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

**FROM** 

 $1.00000 ml \ of \ M6033 + 2.50000 ml \ of \ M5288 + 2.50000 ml \ of \ M5515 + 5.00000 ml \ of \ M5498 + 5.00000 ml \ of \ M5806 + 79.00000 ml \ of \ MP83014 \ = Final \ Quantity: 100.000 \ ml$ 

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3947	S7(SFAM,6020,200.8)	MP83032	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

**FROM** 

0.40000 ml of M5513 + 1.00000 ml of M5799 + 1.00000 ml of M5818 + 1.00000 ml of M5981 + 1.00000 ml of M5983 + 1.90000 ml of M6033 + 10.00000 ml of M6115 + 2.00000 ml of M5815 + 2.00000 ml of M5817 + 2.50000 ml of M5476 + 4.00000 ml of M5390 + 4.90000 ml of M5515 + 4.90000 ml of M5519 + 5.00000 ml of M6095 + 50.00000 ml of M5304 + 832.80000 ml of M5498 + 9.00000 ml of M5519 + 9.00000 ml of M5576 + 9.00000 ml of M5578 + 9.90000 ml of M5751 + 9.90000 ml of M5769 + 9.90000 ml of M5806 = Final Quantity: 1000.000 ml



# **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By  Mohan Bera
3948	S6(SFAM,6020,200.8)	MP83033	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP ETTE_3 (A)	

**FROM** 0.50000ml of M6095 + 1.00000ml of M6115 + 48.50000ml of W3112 + 50.00000ml of MP83032 = Final Quantity: 100.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u> 3954	NAME  \$4/\$5AM \$020 200 8\	NO.	Prep Date 11/02/2024	<u></u>	<u>By</u> Sarabiit Jaswal	ScaleID None	PipetteID  METALS PIP	Mohan Bera
3954	S4(SFAM,6020,200.8)	MP83034	11/02/2024	11/25/2024	Sarabjit Jaswai	None	ETTE_3 (A)	11/04/2024

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 86.00000ml of W3112 + 12.50000ml of MP83032 = Final Quantity: 100.000 ml





# **Metals STANDARD PREPARATION LOG**

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3949	S5(SFAM,6020,200.8)	MP83035	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3951	S3(SFAM, 6020,200.8)	MP83036	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 88.50000ml of W3112 + 10.00000ml of MP83033 = Final Quantity: 100.000 ml



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# Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3955	S2CONC(SFAM,6020,200.8)	MP83037	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

**FROM** 

0.05000 ml of M5698 + 0.05000 ml of M5798 + 0.05000 ml of M5800 + 0.05000 ml of M5801 + 0.05000 ml of M5961 + 0.05000 ml of M5981 + 0.05000 ml of M5982 + 0.05000 ml of M5983 + 0.05000 ml of M6023 + 0.05000 ml of M6025 + 0.05000 ml of M6030 + 0.10000 ml of M5658 + 0.10000 ml of M5751 + 0.10000 ml of M5802 + 0.10000 ml of M6033 + 0.25000 ml of M5515 + 0.25000 ml of M5799 + 0.25000 ml of M5819 + 0.25000 ml of M5962 + 0.25000 ml of M5976 + 0.25000 ml of M5976 + 0.25000 ml of M5390 + 0.50000 ml of M5818 + 1.25000 ml of M5815 + 1.25000 ml of M5817 + 2.50000 ml of M5498 + 2.50000 ml of M5519 + 2.50000 ml of M5769 + 2.50000 ml of M5806 + 2.50000 ml of M6095 + 226.25000 ml of W3112 + 5.00000 ml of M6115 = Final Quantity: 250.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3956	S2(SFAM,6020,200.8)	MP83038	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 98.00000ml of W3112 + 0.50000ml of MP83037 = Final Quantity: 100.000 ml





# **Metals STANDARD PREPARATION LOG**

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3957	S1(SFAM,6020,200.8)	MP83039	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

FROM 0.50000ml of M6095 + 1.00000ml of M6115 + 88.50000ml of W3112 + 10.00000ml of MP83038 = Final Quantity: 100.000 ml

Recipe			,	Expiration	<u>Prepared</u>	0 1 10	D: 44 ID	Supervised By
<u>ID</u> 3958	NAME ICV(SFAM)	NO. MP83041	Prep Date 11/02/2024		<u><b>By</b></u> Sarabjit Jaswal	<u>ScaleID</u> None	PipetteID  METALS PIP	Mohan Bera
	,				,		ETTE_3 (A)	11/04/2024

**FROM** 2.00000ml of M5294 + 98.00000ml of MP83014 = Final Quantity: 100.000 ml



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# Metals STANDARD PREPARATION LOG

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3961	CCV	MP83042	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

**FROM** 

0.20000 ml of M5513 + 0.50000 ml of M5799 + 0.50000 ml of M5818 + 0.50000 ml of M5981 + 0.50000 ml of M5983 + 1.00000 ml of M5815 + 1.00000 ml of M5817 + 1.25000 ml of M5476 + 10.00000 ml of M6115 + 12.45000 ml of M5515 + 12.45000 ml of M5519 + 2.00000 ml of M5390 + 24.95000 ml of M5498 + 24.95000 ml of M5769 + 24.95000 ml of M5806 + 25.00000 ml of M5598 + 4.50000 ml of M5598 + 4.50000 ml of M5976 + 4.50000 ml of M5978 + 5.00000 ml of M6095 + 823.45000 ml of W3112 = Final Quantity: 1000.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
1142	ICSA ICPMS	MP83043	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

FROM 10.00000ml of M5873 + 90.00000ml of MP83014 = Final Quantity: 100.000 ml





# Metals STANDARD PREPARATION LOG

Recipe			<b>Expiration</b>	<u>Prepared</u>			Supervised By
<u>ID</u> <u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
1143 ICSAB ICPM	MP83044	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
						ETTE_3 (A)	11/04/2024

FROM 10.00000ml of M5873 + 10.00000ml of M5874 + 80.00000ml of MP83014 = Final Quantity: 100.000 m
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Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3962	MG 10PPM FOR TUNE	MP83048	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

**FROM** 0.01000ml of M5769 + 9.99000ml of MP83014 = Final Quantity: 100.000 ml





# Metals STANDARD PREPARATION LOG

<u>Recipe</u>				<b>Expiration</b>	<u>Prepared</u>			Supervised By
ID N	IAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3894 TU	UNE 200PPB	MP83049	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

FROM	2.00000ml of M6055 + 2.00000ml of MP83048	+ 98.00000ml of MP83014	= Final Quantity: 100.000 ml
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Recipe				<b>Expiration</b>	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3903	ISS 3PPM	MP83050	11/02/2024	11/25/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	11/04/2024

FROM 5.00000ml of M6115 + 75.00000ml of M5739 + 170.00000ml of MP83014 = Final Quantity: 250.000 ml





# **Metals STANDARD PREPARATION LOG**

Recipe ID 1060	NAME AG 1.0PPM	NO. MP83071	Prep Date 11/02/2024		Prepared By Sarabjit Jaswal	<u>ScaleID</u> None	PipetteID None	Supervised By Mohan Bera 11/05/2024
FROM	0.01000ml of M6030 + 9.99000ml of	MP83014 =	Final Quanti	ty: 10.000 ml				



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	051722	05/17/2025	07/01/2022 / bin	06/17/2022 / jaswal	M5192	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	071122	07/11/2025	09/01/2022 / jaswal	07/21/2022 / jaswal	M5288	
Supplier	ItemCode / ItemName	Lot #	Expiration Date			Chemtech Lot #	
Absolute Standards, Inc.	58113 / Aluminum (AI) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	01/01/2025	12/13/2023 / bin	02/20/2020 / bin	M5294	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Inorganic Ventures	6020CAL-1 / Calibration Standard Method 6020	S2-MEB711244	10/20/2026	08/07/2024 / jaswal	04/01/2022 / jaswal	M5304	
				<u> </u>			
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57138 / Sr, 10000 PPM, 125 ml	082922	082922 08/09/2025		03/16/2023 / jaswal	M5476	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026 08/15/2023 / jaswal		03/17/2023 / bin	M5498	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	061522			03/17/2023 / bin	M5513	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	092122	09/21/2025	08/01/2024 / Jaswal	03/17/2023 / bin	M5515	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	120822	12/08/2025	01/08/2024 / bin	03/17/2023 / bin	M5519	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
norganic CLPP-SPK-1 / SOIL/WATER SPIKE SOLN 1, 125mL		T2-MEB721963	07/27/2027	05/30/2023 / jaswal	05/26/2023 / jaswal	M5565	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
PCI Scientific Supply, Inc.	1403 / Hydrogen Peroxide, 30% 1 gal	820803	02/03/2025	04/18/2024 / jaswal	08/03/2022 / Al-Terek	M5634	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Inorganic Ventures	-		07/07/2027			M5657	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	solute 58024 / Chromium, Cr,		06/05/2026	5/2026 08/28/2023 / 08/ jaswal jaswa		M5658	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	102523	10/25/2026	04/03/2024 / jaswal	10/27/2023 / jaswal	M5697	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	102623	10/26/2026	04/18/2024 / jaswal	10/27/2023 / jaswal	M5698	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
norganic 6020ISS / 6020ISS, 10 ug/ml, Bi, Ho, In, 6Li, Rh, Sc, TB, Y		T2-MEB709511	09/03/2026	08/07/2024 / jaswal	04/11/2022 / jaswal	M5739	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	071723	07/17/2026	10/01/2024 / Jaswal	08/25/2023 / jaswal	M5751	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	091823	09/18/2026	05/24/2024 / Jaswal	01/03/2024 / bin	M5769	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	,		10/25/2026	02/09/2024 / bin	02/09/2024 / bin	M5798	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	071123	07/11/2026	02/09/2024 / bin	02/09/2024 / bin	M5799	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	091923	09/19/2026	05/31/2024 / bin	02/09/2024 / bin	M5800	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Absolute Standards, Inc.	57033 / As, 1000 PPM, 125 ml	111323	11/13/2026	02/09/2024 / bin	02/09/2024 / bin	M5801	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	120523	12/05/2026	08/07/2024 / jaswal	01/03/2024 / jaswal	M5802	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	122223 12/22/20		08/01/2024 / Jaswal	01/03/2024 / jaswal	M5806	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	, , , , , , , , , , , , , , , , , , , ,		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 /	Chemtech Lot #	
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	071123	07/11/2026	03/01/2024 / jaswal	02/09/2024 / jaswal	M5817	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	122023	12/20/2026	03/06/2024 / jaswal	02/09/2024 / jaswal	M5818	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	111623	11/16/2026	03/20/2024 / jaswal	02/09/2024 / jaswal	M5819	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	, , , , ,		09/11/2026	05/01/2024 / jaswal	02/09/2024 / jaswal	M5820	
Supplier	Supplier ItemCode / ItemName		Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
PART A / ICSA (ICPMS ) STOCK SOLN		CP-MS ICSA-0803	04/30/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5873	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
EPA	PART B / ICSB (ICPMS) STOCK SOLUTION	CP-MS ICSB-0803	04/30/2025	04/17/2024 / jaswal	07/14/2022 / jaswal	M5874	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	12/08/2024	06/21/2024 / Al-Terek	06/07/2024 / Al-Terek	M5935	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Absolute Standards, Inc.	57028 / Ni, 1000 PPM, 125	041124	04/11/2027	07/02/2024 / Jaswal	06/11/2024 / Jaswal	M5961	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	060624	06/06/2027	07/02/2024 / Jaswal	06/14/2024 / Jaswal	M5962	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Inorganic Ventures			07/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5976	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Inorganic Ventures	rganic CGTI1-1 / TITANIUM		06/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5978	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57092 / U, 1000 PPM, 125 ml	060724	06/07/2027	07/29/2024 / Jaswal	06/11/2024 / Jaswal	M5981	
		<del></del>	Expiration Date Opened		Received Date /	Chemtech	
Supplier	ItemCode / ItemName	Lot #	Date	Opened By	Received By	Lot #	
Supplier  Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	Lot # 031524	1 -		Received By 06/11/2024 / Jaswal		
Absolute	57038 / Sr, 1000 PPM,		Date	<b>Opened By</b> 07/01/2024 /	06/11/2024 /	Lot #	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	062424	06/24/2027	09/28/2024 / jaswal	08/05/2024 / Jaswal	M6021	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	0624724 06/27/2027		08/05/2024 / 08/05/2024 / Jaswal		M6023	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57082 / Pb, 1000 PPM,		06/12/2027	08/05/2024 / Jaswal	08/05/2024 / Jaswal	M6025	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	070124	07/01/2027	08/05/2024 / kareem	01/25/2019 / Jaswal	M6028	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
Supplier  Absolute Standards, Inc.	ItemCode / ItemName  57047 / Ag, 1000 PPM, 125 ml	Lot # 122823	-	-			
Absolute	57047 / Ag, 1000 PPM,		Date	Opened By 08/05/2024 /	<b>Received By</b> 08/05/2024 /	Lot #	



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	02/02/2025	08/24/2024 / Janvi	08/01/2024 / Janvi	M6037	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	24D1562005	02/08/2025	08/09/2024 / jaswal	08/01/2024 / Janvi	M6040	
Supplier	ItemCode / ItemName	Lot #	Expiration Date Opened / Date Opened By		Received Date / Received By	Chemtech Lot #	
Inorganic Ventures	IV-STOCK-12 / ICP-MS TUNING SOLUTION, 125mL	U2-MEB734294	06/21/2028	08/21/2024 / Jaswal	08/19/2024 / Jaswal	M6055	
Supplier	ItemCode / ItemName	Lot #	Expiration	Date Opened /	Received Date /	Chemtech	
Сиррпо	itemcode / itemname	LOC #	Date	Opened By	Received By	Lot #	
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	Lot #	<b>Date</b> 03/17/2029	Opened By 10/26/2024 / Janvi	Received By 10/21/2024 / Janvi	Lot # M6095	
	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed	Lot #		10/26/2024 /	10/21/2024 /		
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)		03/17/2029 Expiration	10/26/2024 / Janvi	10/21/2024 / Janvi	M6095	
Seidler Chemical  Supplier	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)  ItemCode / ItemName  BA-9598-34 / Nitric Acid,	Lot #	03/17/2029  Expiration Date	10/26/2024 / Janvi  Date Opened / Opened By  10/31/2024 /	10/21/2024 / Janvi  Received Date / Received By  09/29/2024 /	M6095  Chemtech Lot #	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	DIW / DI Water	Daily Lab-Certified	10/24/2024	10/24/2019 / apatel	10/24/2019 / apatel	W2606

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

Absolute Standards, Inc. 800-368-1131

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# Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

**Expiration Date:** 

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

**SDS Information** 

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

**NIST** SRM

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

1 of 2

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

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# Physical Characterization:

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

Certified by:

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

\* All standard containers are meticulously cleaned prior to use.

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

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

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

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

Part # 57048

2 of 2

# 800-368-1131 Absolute Standards, Inc.

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# Certified Reference Material CRM

R: 8/5/24

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

CERTIFIED WEIGHT REPORT:

Part Number: 57182

Solvent:

24002546

Nitric Acid

Lot#

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

Revenue

1 40.0

Description: Lot Number: 110923 Lead (Pb)

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

Nominal Concentration (µg/mL): NIST Test Number: **6UTB** 10000

Weight shown below was diluted to (mL): Cot 2000.02 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target

IN029 PBD122016A1 RW# Number Conc. (µg/mL) 10000 99.999 38 Purity (%) 0.10 62.5 **3** 32.0006 Weight (g) 32.0040 Weight (g) Conc. (µg/mL) 10001.1 20.0 10099-74-8 0.05 mg/m3 intryns-rat 93 mg/kg 3128

Actual Actual

Uncertainty Expanded

Reviewed By:

Pedro L. Rentas

110923

+/- (µg/mL) CAS#

OSHA PEL (TWA) SDS information

(Solvent Safety Info. On Attached pg.)

# OSHA PEL (TWA) LD50 TSIN SRM

 Lead(II) nitrate (Pb) 1.0E7 [1] Spectrum No.1 [ 17.284 sec]:58182.D# [Count] [Linear]



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

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

						ı	I race Me	Metals	Verifica	T S	by ICP-	NS (	μg/mL)			1			
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Œ	40.02	ξ	40.02	Au	40.02	3	T	Z	<0.02	×	40.2	_	જ	Т	<0.02	<0.02 Ta ·	√0.02 Ta √0.02	40.02 Ta 40.02 Ti	40.02 Ta 40.02 Ti

# Physical Characterization:

(T)= Target analyte

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

Sor I Mill

- \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \*Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in
- the preparation of all standards.
- \* All standard containers are meticulously cleaned prior to use.
- \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All Standards should be stored with caps tight and under appropriate laboratory conditions.

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

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

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# Certified Reference Material CRM

M.5192 R: 06/17/2

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

CERTIFIED WEIGHT REPORT: Ammonium molybdate (Mo) Compound Nominal Concentration (µg/mL): m/z-> M/z-> Recommended Storage: m/z-> Volume shown below was diluted to (mL): 2.0E6 1.0E6 1.0E5 2.0E5 2000 1000 **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 58142 Number Part **BTU9** 1000 57042 Ambient (20 °C) 051722 051725 Molybdenum (Mo) 022222 Fot 120 220 20 [ 8.594 sec]:57042.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 230 30 5E-05 300.0 Vol. (mL) 0.058 Initial Flask Uncertainty Balance Uncertainty Pipette (mL) Conc. (µg/mL) Uncertainty 0.084 240 140 40 MKBQ8597V Ammonium hydroxide Nominal Lot # 0.5% 1000 250 150 50 Conc. (µg/mL) 10001.0 Initial (III) 15.0 160 260 60 Conc. (µg/mL) Ammonium hydroxide 1000.0 Final 170 70 Formulated By: Reviewed By: Uncertainty +/- (µg/mL) Expanded 2.1 180 80 13106-76-8 (Solvent Safety Info. On Attached pg.) Lawrence Barry OSHA PEL (TWA) Pedro L. Rentas 5 mg(Mo)/m3 190 90 SDS Information 200 100 orl-rat 333 mg/kg 051722 051722 3134 SRM TSIN

Printed: 6/16/2022, 1:36:08 PM

# Certified Reference Material CRM



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

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# Physical Characterization:

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

Certified by:

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

\* All standard containers are meticulously cleaned prior to use.

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

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

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

3

Certified Reference Material CRM

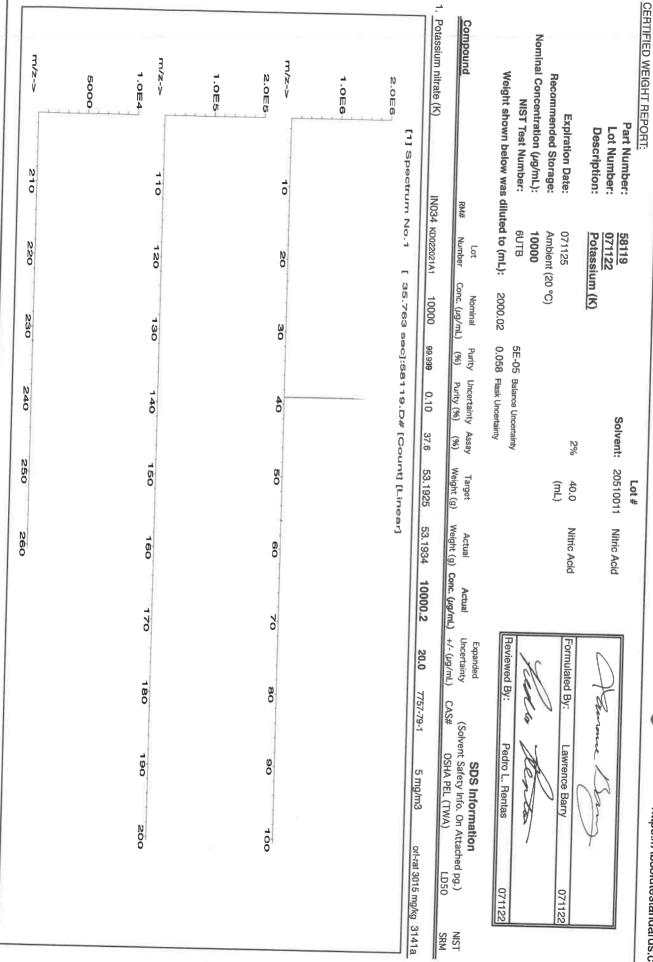
www.absolutestandards.com

800-368-1131

Absolute Standards, Inc.



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



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

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

Physical Characterization:	Al <0.02 Cd <0.02 Dy Sb <0.02 Ca <0.2 Er As <0.2 Ce <0.02 En Ba <0.02 Cs <0.02 Gd Be <0.01 Cr <0.02 Ga Bi <0.02 Cu <0.02 Ga Bi <0.02 Cu <0.02 Ga	
11 1002 41	<0.002         Hf         <0.002         Li         <0.002         Ni         <0.002         Pr         <0.02         Se         <0.2         Tb         <0.002         W         <0.02           <0.002	Trace Metals Verification by ICP-MS (ug/ml)

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

Certified by:

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

\* 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).

 $^{\star}$  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 # 58119

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



Part # 58113



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

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Physical Characterization:

(I)= larger analyte

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

Certified by:

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

2 of 2

Part # 58113



# QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R: 4120/21

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 instructions and the analytical protocol or your contract, disregard these instructions.

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

**CAUTION:** Read instructions carefully before opening bottle(s) and proceeding with

the analyses.

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

> Safety Data Sheets Available Upon Request

# (A) SAMPLE DESCRIPTION

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

## (B) BREAKAGE OR MISSING ITEMS

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

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

# (C) ANALYSIS OF SAMPLES

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

ICV1-1014

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

Page 1 of 2



RMs ICV 1, 5, 6 SFAM.docx



# 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) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> 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<sub>3</sub>Fe(CN)<sub>6</sub>, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

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



# 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: 6020CAL-1

Lot Number: S2-MEB711244

Matrix: 5% (v/v) HNO3

tr. HF

Value / Analyte(s): 20 µg/mL ea:

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

# 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

# **Assay Information:**

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

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  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 <a href="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

October 20, 2021

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

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

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Director, Quality Control

### Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

Paul R Saines

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number:

57056

Solvent:

20510011

Nitric Acid

200

40.0

Nitric Acid

Description: Lot Number:

072122 Barium (Ba)

Certified Reference Material CRM

Riograph 33

Lot #

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

Formulated By: Liovannie Giovanni Esposito appeal 2

072122

Reviewed By: Pedro L. Rentas 072122

IN023 BAD022019A1 RM# Number 5 Conc. (µg/mL) Nominal 1000 99.999 Purity 8 Uncertainty Assay Purity (%) 0.10 52.3 <u>8</u> Weight (g) 3.82417 Target Weight (g) Conc. (µg/mL) 3.82426 Actual 1000.0 Actual +/- (µg/mL) Uncertainty Expanded 2.0 10022-31-8 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SDS Information 0.5 mg/m3 orl-rat 355 mg/kg 3104a SRM TSIN

1. Barium nitrate (Ba)

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 072125

**NIST Test Number:** 

Recommended Storage:

**Expiration Date:** 

Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

m/z-> **1/2-**2 17/2-Y 2.5E6 5.0E6 2.0E5 1.0ES 2.0E6 1.OE6 [1] Spectrum No.1 210 110 0 220 120 N O [ 12.514 sec]:58156.D# [Count] [Linear] 130 230 30 140 240 4 250 150 Ö. 160 260 00 170 8 180 80 190 90 200 100

## 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):

						•	Traca M.	otolo	Varifica	+ion	ו מטן ייץ	1 37	1					l	
							1	נמונו	۱^		ביים עמ	2	pg/mL)						
					No. of Lot, House, etc., in case, or window,													ı	
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AS	7.02	3	Z0:07	2	<0.02	드	<0.02	Mg	₹0.07	ő	<0.02	Rh	<0.00	Ag	2007	F	50 9	77	6
Ha	€	ێ	2002	3	5000	,1	000	>	200	i		1	***************************************	0	70.05	1	70.07	>	70:05
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Be	<0.01	Ö	<0.02	Ğ	<0.02	Ę.	<0.2	Ho	<0.2	۵	200	å	6	į,	1 6	Ę	0.00	; ;	70:05
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1			2010		7000	7 0	70.05	DAT	Z0:0>	4	787	S	<0.02	2	202	Ë	200	,	5000

Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

<sup>\*</sup> The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

<sup>\*</sup> 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).

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

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

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



ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com 031523 031523 Giovanni Esposito Pedro L. Rentas Liovanni Formulated By: Reviewed By: Certified Reference Material CRM Nitric Acid Nitric Acid Solvent: 21110221 Lot # 60.0 (mL) % 5E-05 Balance Uncertainty 0.058 Flask Uncertainty 3000.41 Ambient (20 °C) Calcium (Ca) Weight shown below was diluted to (mL): 031523 031526 10000 **6UTB** Recommended Storage: Nominal Concentration (µg/mL): Part Number: Lot Number: Description: **Expiration Date:** NIST Test Number: CERTIFIED WEIGHT REPORT:

Compound	RM#	Lot Number	Nominal Purity Conc. (µg/mL) (%)	Punty (%)	Purity Uncertainty Assay (%) Purity (%) (%)		Target Weight (g)	Actual Weight (g)	Expanded Actual Actual Uncertainty (Sc Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS#	Expanded Uncertainty +/- (ug/mL)	(Solv	SDS Information (Solvent Safety Info. On Attached pg.)  NS# OSHA PEL (TWA) LD50	Attached pg.) LD50	NIST
1. Calcium carbonate (Ca)	IN014	INO14 caboragezat	10000 99.999	666.66	0.10	38.9	75.1990	75.2093	10001.4	20.0	471-34-1	5 mg/m3	ort-rat	3109a
[1] S <sub>1</sub>	[1] Spectrum No.1		4.00	8ec]:6	12.514 sec]:58120.D# [Count] [Linear]	<u> </u>	unti (Line	ari						
1.0E4														
m/z->	0	.0		000	.0	400400	0	0	2		0		001	
2. 4 4														
m/z->	0	120		90	140		150	160	071	0	180	190		
6.0E4														
m/z->	019	220		230	240		250	260						

Printed: 3/16/2023, 1:45:15 PM





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

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

						Trace Me	tals	Verificat	ioi	by ICP-N	MS (	$(\mu g/m\Gamma)$		r				
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707	ర	<0.02	පි	<0.02	片	<0.02	Mn	<0.02	Z	<0.02	2	<0.02	ž	<0.2	Ę	<0.02	¥9	40.02
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707	රි	40.02	පි	₹0.02	3	20.0≥	Wo	<0.02	五	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	2	₹0.02
707	ਰੋ	<0.02	Αū	<0.02	2	<0.02	PN	<0.02	×	40.2	S	<0.02	Ta	<0.02	Ξ	<0.02	Z	40.02
	6.00 6.00 6.00 6.00 6.00 6.00		3 5 5 5 5 5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Cd	Cd	Cd	Cd	Cd	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02           Ca         T         En         -0.02         Ho         -0.02         Li         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mg         -0.02           Cr         -0.02         Ga         -0.02         Fe         -0.02         Mn         -0.02           Co         -0.02         Ga         -0.02         Fe         -0.02         Mo         -0.02           Cu         -0.02         Au         -0.02         Fe         -0.02         Mo         -0.02	Cd         -60.02         Dy         -60.02         Hf         -60.02         Li         -60.02         Ni           Ca         T         En         -60.02         Ho         -60.02         Lu         -60.02         Nh           Ca         -60.02         Eu         -60.02         In         -60.02         Mn         -60.02         Pd           Cr         -60.02         Ga         -60.02         Fe         -60.2         Hg         -60.2         Pr           Co         -60.02         Ga         -60.02         La         -60.02         Rr         -60.02         Rr           Cu         -60.02         Au         -60.02         Pr         -60.02         Rr	Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002           Ca         T         En         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002           Ce         -6.002         Eu         -6.002         In         -6.002         Mg         -6.012         Nh         -6.002           Cr         -6.002         Gd         -6.002         Fe         -6.02         Mn         -6.02         Pd         -6.02           Cr         -6.002         Gg         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02           Cu         -6.002         Au         -6.002         In         -6.002         R         -6.002           Cu         -6.002         Au         -6.002         Ph         -6.002         R         -6.002	Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002         Pr           Ca         T         Ea         -6.002         Ho         -6.002         Lu         -6.002         Nb         -6.002         Rc           Ce         -6.002         Eu         -6.002         Ir         -6.002         Mn         -6.002         Rb         -6.002         Rb           Cr         -6.002         Ga         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02         Ru           Co         -6.002         Ga         -6.002         La         -6.002         Rr         -6.002         Rr           Co         -6.002         Ga         -6.002         Pr         -6.002         Rr         -6.002         Rr           Cu         -6.002         Au         -6.002         Pr         -6.002         Rr         -6.002         Sr	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02           Ca         T         Ba         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02           Ce         -0.02         Bu         -0.02         Ir         -0.02         Mg         -0.01         Os         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Mn         -0.02         Pr         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02	Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Re         -d002         Si           Ca         T         Ea         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Re         -d002         Si           Ca         -d002         Ea         -d002         Hr         -d002         Mn         -d002         Rh         -d002         Na           Cr         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Ru         -d002         Na           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr           Cu         -d002         Au         -d002         Nd         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02         Se         -0.02           Ca         T         Eu         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02         Si         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Cr         -0.02         Ga         -0.02         Ir         -0.02         Hg         -0.02         Ru         -0.02         Na         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Ru         -0.02         Sr         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Cr         -0.02         Fr         -0.02         Rr         -0.02         Sr         -0.02         Sr         -0.02           Cr         -0.02         Fr         -0.02         Rr         -0.02         Sr	Cd         4002         Dy         4002         H         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Th           Ca         T         Ea         4002         Ha         4002         Lu         4002         Nb         4002         Rb         4002         Tr           Ca         4002         Eu         4002         Ha         4002         Pd         4002         Rb         4002         Tr           Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Sr         4002         Sr         4002           Cr         4002         Au         4002         Rr         4002         Rr         4002         Sr         4002         Sr         4002         Sr

(T) = Target analyte

## Physical Characterization:

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



Certified by:

Printed: 3/16/2023, 1:45:15 PM

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

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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.

<sup>\*</sup> 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). \* All Standards should be stored with caps tight and under appropriate laboratory conditions.

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



800-368-1131 www.absolutestandards.com	100	Å		•	Sertified .	Refere	Since Mai	Certified Reference Material CRM	1/203 (	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	ANAB ISO 17034 Accredited AR-1539 Certificate Number ttps://Absolutestandards.com	credited Number rds.com
CERTIFIED WEIGHT REPORT:						1	Lot#			る				
Fart Number: Lot Number: Description:		57182 061522 Lead (Pb)			Solvent:		20510011	Nitric Acid		Hieram	ranvie Ed	peate		
Expiration Date:		081525				%	40.0	Nitric Acid		Formulated By:	Giovann	Giovanní Esposito	061522	
Recommended Storage: Nominal Concentration (µg/mL):		Ambient (20 °C) 10000	Ő				(TE)			Ph	May 1	C/S		
NIST Test Number: 6UTB Weight shown below was diluted to (mL):	r: 6U as diluted		2000.02	5E-05 B 0.058 FI	5E-05 Balance Uncertainty 0.058 Flask Uncertainty	inty 4				Reviewed By:	Pedro L	Pedro L. Rentas	061522	
Compound	RM#	Lot Number C	Lot Nominal Purity Uncertaint Number Conc. (µg/ml.) (%) Purity (%)	Purity (	×	- 1	Target Weight (g)	Expanded Actual Actual Uncertainty Weight (g) Conc. (µg/mL) +/- (µg/mL)	Actual	Expanded Uncertainty (4+-(µg/mL) CAS#	SD: (Solvent Safe S# OSHA	SDS information (Solvent Safety Info. On Attached pg.)  # OSHA PEL (TWA) LDSC	l pg.) LD50	NIST

SRM

1. Lead(II) nitrate (Pb)	INO29 PBD122016A1	10000	88.888	0.10	62.5	32.0006	32.0041 10001.1		20.0	10099-74-8	0.05 mg/m3	intryne-rat 83 mo/kg 3128	3128
1.0E7	[1] Spectrum No.1	17.284 sec]:58182.D# [Count] [Linear]	ec]:58	82.D*	Cour	nt] [Line		1				p h	
S.0E8													
m/z->>	0 P	O		.0		0.00	9	02		08	0	100	
1.0E6													
m/z->	1100	190		04	i) Er	150	160	170	, T	180	0.00	000	
5.0ES													
Å	220	230		240		250	260						

Lot # 061522

## 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):

						Ī	Trace Me	stals	Verifica	tion	by ICP-	SM	(ma/m)		,				
Section 1	May be seen annual	į	WORNING STREET	Name of Street	3-5-40. 1. 1. 1. 3-2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	-	THE PROPERTY OF THE PARTY OF TH	CAMPBOOK					2	Commence of the last					
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Sp	<0.02	ථ	<0.2	ď	200	H	200	ž	969	1	9	è	2000	3	100	2	20.02	*	7mm>
V V	ç	d	1 6	,		2	777	3	70:05	ON T	70.02	2	7070>	7	₹0.02	<u>e</u>	\$0.02	Þ	<b>40.02</b>
ĉ	7.02	3	Z0:02	S S	Q0:05	크	8002	Mg	<b>40.0</b> 1	ර	<b>40.02</b>	Rh	<b>40.02</b>	Ao	<b>CD CD</b>	F	200	2	8
Ba	<0.02	రో	<0.02	3	<0.02	4	<0.02	M	<0.02	Ъ	2002	40	8	0 2	6	į	70:00	- E	70.00
Be	<0.01	Ö	<0.02	S	<0.02	Ę,	402	H	5	. 0	600		7000	2 0	707	= 6	20.02	Q.	Z0.02
ž	2000	S	200	2	8	-	9 6	9	700	- é	20.02	1	70'05	ă	<b>40.002</b>	Ħ	<b>40.02</b>	×	<0.02
i	200	3 6	70.00	5 .	20.02	3	70:05	WIO	<0.02	Σ,	<0.02	SH	<0.02	S	<0.02	Sn	₹0.02	Z	40.02
	70.02	3	70'02	Au	<0.02	£	T	ž	40.02	×	\$ \$	S	<0.02	Ę	<b>CD 02</b>	Ę	29	2	8

Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 061522

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

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Certified Reference Material CRM

R : 03 | 17 | 12



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

Diovanne

Nitric Acid

Solvent: 20510011

#ioj

Nitric Acid

350.0 (m)

7.0%

092122 092122 Giovanni Esposito Pedro L. Rentas Formulated By: Reviewed By:

٠.						
SDS Information	(Solvent Safety Info, On Attached pg.)	L) CAS# OSHA PEL (TWA) LD50				
Expanded	Actual Actual Uncertainty	1/- (ug/mL)				
	Actual	Conc. (ug/mL)				
		_				
1	arget	Weight (g)				
	Assay	9				
1	Uncertailmy	runty (%)				
Purity Uncertainty Assay (%) Purity (%) (%)						
Nominal	Conc (un/ml)	COLLEG (ARRYTHL)				
ŧ	Number					
	RM#					
	Compound					

5E-05 Balance Uncertainty 0.12 Flask Uncertainty

5000.1

Weight shown below was diluted to (mL):

NIST Test Number:

Ambient (20 °C)

10000 **6UTB** 

092125

Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):

Iron (Fe) 092122

Description: Lot Number:

Part Number:

CERTIFIED WEIGHT REPORT:

128 128	orl-rat 7500mg/kg 3126a	no Em/gm c	1409-09-0	Ш										
			20.0 7430.80.6		0.10 100.0 50.0034 50.0111 10001.5	50.0111	50.0034	100.0	0.10	98.985	10000	3 2224912-500	IN34	Iron (Fe)
SKE	LUSO	COLOR FEET (TWA)	L COLON											
2	(34)	OCHA DEI (TAKA)	CAC#	(  m/m/) -/+	Conc. (vo/ml.)	Weight (g)	Weight (g)	(%)	Purity (%)	<u>8</u>	Conc. (µg/mL)	Number	KMH	
Į.	7 00 00	Uncertainty Assay Target Actual Actual Uncertainty (Solvient Safety Info On Actual	(Soh	Uncertainty	Actual	Actual	y Uncertainty Assay Target	Assay	Uncertainty	Purity	Nominal	5		Compound
										-	-	- made		

		110-10 SEE4912-000	2000	99.985	0.10	100.0	50.0034	50.0111 10001.5	10001.5	20.0	7439-89-6	5 mg/m3	orl-rat 7500mg/kg 3126a
2.064	1) Spectrum No.1	[1] Spectrum No.1 [ 30.763 sec]:58126.D# [Count] [Linear]	[Count] [Linear]					_					
1.054								_					
m/z->	10-1	50	0 8		-6		.00	-09	02		08	. 06	100
5.0E7	110	120	130		140		150	160	170		180	0 61	500
S.0E7	0.6												
L	1	220	230		240		250	260					

## Certified Reference Material CRM





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

							Trace Me	stals	Verificat	ion b	y ICP-MS	gu)	/mL)						
STORY .	000				200		404				NAME OF TAXABLE PARTY.								
æ	40.02	3	70.05	ŝ	70'0>	Ē	70102	3	Z0702	ž	<0.10	£	Z070≥	š	402	e	<b>40.02</b>	*	40.02
S.	<0.02	రే	<b>4</b> 02	山	<0.02	He	<b>40.02</b>	3	<0.02	ź	<0.02	Re	<0.02	ૹ	<b>40.02</b>	<u>6</u>	<0.02	n	<0.02
As	Ø.2	ප	<0.02	큡	<0.02	멸	<0.02	Mg	<0.01	ő	<0.02	꿆	<0.02	Ag	<0.02	F	<0.02	>	<0.02
Ba	<b>40.02</b>	ඊ	Ø.02	3	<0.02	ㅂ	<b>40.02</b>	Ma	<0.10	몺	<0.02	8	<0.02	Š	40.2	Ē	<0.02	χ.	<0.02
Be	<b>₩</b>	ŏ	<b>40.05</b>	පී	<0.02	£	40.2	Hg	40.2	Δ.	<0.02	Ru	<0.02	Ŗ	<0.02	뎚	<0.02	<b>X</b>	<0.02
Ä	<b>40.02</b>	රි	Ø.10	ප	40.10	ጟ	<b>40.02</b>	Mo	<b>40.02</b>	£	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Z	<0.05
В	<0.02	ರ	<0.10	Απ	<0.02	£	<0.02	R	<0.02	M	<0.2	ß	<0.02	Ta	<0.02	F	<0.02	Z	<0.02

(T)= Target analyte

## Physical Characterization:

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



Certified by:

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

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2 of 2

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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

Description: Lot Number:

58119 120822 Potassium (K)

Solvent: 20510011 Nitric Acid

Lot #

Javanva

アイクラクスで

60.0 <u>a</u>

2%

Nominal Concentration (µg/mL):

NIST Test Number:

**6UTB** 10000 Ambient (20 °C) 120825

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

3000.4

5E-05 Belance Uncertainty

0.06 Flask Uncertainty

Nitric Acid

Formulated By:

Giovanni Esposito

120822

Reviewed By:

Pedro L. Rentas

120822

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

m/z-y	5000	m/z->	1.0E5	m/z->	1.000	2.016
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		170		8		
		180		Ö		
		190		0		
		A.				
		200		100		,

Lot # 120822

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

	Bi Be	
	4000 4000 4000 4000 4000	
	<b>585888</b> 8	
Œ	40.02 40.02 40.02 40.02 40.02 40.02	
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Target analyte	K P P Z O K N	ation
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	S B B B B B	SW
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	Ja Sr Na Se Se	
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	4000 4000 4000 4000 4000	
	55~\$<□≤	
	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	

## 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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Lot # 120822



### 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-SPK-1

Lot Number:

T2-MEB721963

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

2 000 µg/mL ea:

Aluminum,

Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Manganese,

Nickel,

Vanadium,

Cabalt

Zinc,

Cobalt,

250 µg/mL ea:

Copper,

200 µg/mL ea: Chromium,

50 µg/mL ea:

Beryllium,

Silver

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

1.070 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
Ва	ICP Assay	3104a	140909
Ba	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Co	ICP Assay	3113	190630
Co	EDTA	928	928
Cr	ICP Assay	3112a	170630
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
V	IC Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928

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

### Characterization of CRM/RM by Two or More Methods

Certified Value, X<sub>CRMRM</sub>, 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:

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

CRM/RM Expanded Uncertainty (1) =  $U_{CRM/RM} \approx k (u^2_{cher} + v^2_{bb} + v^2_{lts} + v^2_{tr})^{1/2}$ 

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certifled Value,  $\mathbf{X}_{\text{CRM/RM}}$ , where one method of characterization is used is the mean of individual results:

 $X_{CRM/RM} = (X_R) (u_{ohar} a)$ 

X<sub>a</sub> = mean of Assay Method A with

Uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (£) =  $U_{CRM/RM} = k \left(u^2_{chara} + u^2_{bb} + u^2_{lib} + u^2_{bb}\right)^{1/2}$ 

k = coverage factor = 2

 $\mathbf{u}_{\mathrm{char}\,\mathbf{u}}$  = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

uite = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 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

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

July 27, 2022

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

### 11.2 Lot Expiration Date

- July 27, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

Paul Gaines
Chairman / Senior Technical Director

Paul R. Lines

### CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

### **CERTIFICATE OF ANALYSIS**

Date: 8/3/2022

MS631 MS632 MS633 MS634

Lot No 820803

### Hydrogen Peroxide, ACS

Reagent Grade

TEST	MAXIMUM LIMITS	RESULT
Appearance	Colorless and free from suspended matter or sediment	Pass
Assay	29-32%	31.4%
Color (APHA)	10	5
Residue after Evaporation	0.002%	.0001%
Titratable Acid	0.0006 meg/g	< .0006 meq/g
Chloride (CI)	2 ppm	< 1 ppm
Nitrate (NO <sub>3</sub> )	2 ppm	< 1 ppm
Phosphate	2 ppm	< 1 ppm
Sulfate (SO <sub>4</sub> )	5 ppm	<.5 ppm
Ammonium (NH <sub>4</sub> )	5 ppm	< 1 ppm
Heavy Metals (as Pb)	1 ppm	< .1 ppm
Iron (Fe)	0.5 ppm	< .1 ppm
Sodium Stannate	200 – 300 ppb	Pass

<sup>\*\*\*</sup>Our Hydrogen Peroxide is considered un-stabilized because it is very slightly stabilized with Sodium Stannate, 500 ppb maximum, just for safety purposes.

Date of MFG: 8/2022 Retest date: 8/2024

Gina M. Rambo-Office Manager



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com M5657

A: 8/29/22

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

CLPP-SPK-4

Lot Number:

T2-MEB721144

Matrix:

3% (v/v) HNO3

Value / Analyte(s):

100 µg/mL ea:

Antimony,

50 μg/mL ea:

Cadmium,

Thallium,

40 µg/mL ea:

Arsenic,

20 µg/mL ea:

Lead,

10 µg/mL ea:

Selenium

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Antimony, Sb CERTIFIED VALUE 99.9 ± 0.8 µg/mL

ALUE ANALYTE
L Arsenic, As

**CERTIFIED VALUE** 

40.00 ± 0.25 μg/mL

Cadmium, Cd

49.96 ± 0.22 µg/mL

Lead, Pb

19.99 ± 0.10 µg/mL

Selenium, Se

10.00 ± 0.06 µg/mL

Thallium, TI

49.96 ± 0.32 µg/mL

Density:

1.014 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

ANALYTE As	METHOD ICP Assay	NIST SRM# traceable to 3103a	SRM LOT# R2-AS691113
Cd	ICP Assay	3108	130116
Cu	•		130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Pb	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
Se	ICP Assay	3149	100901
Se	Calculated		See Sec. 4.2
TI	ICP Assay	3158	151215
TI	Calculated		See Sec. 4.2

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

Characterization of CRM/RM by Two or More Methods Certified Value, X <sub>CRM/RM</sub> , where two or more methods of characterization are	Characterization of CRM/RM by One Method Certified Value, X <sub>CRM/RM</sub> , where one method of characterization
used is the weighted mean of the results:	is used is the mean of individual results:
$X_{CRM/RM} = \sum_{i} (w_i) (X_i)$	$X_{CRM/RM} = (X_a) (u_{char} a)$
X <sub>i</sub> = mean of Assay Method i with standard uncertainty u <sub>char i</sub>	X <sub>a</sub> = mean of Assay Method A with
$\mathbf{w}_{i}$ = the weighting factors for each method calculated using the inverse square of the variance:	uchar a = the standard uncertainty of characterization Method A
$w_i = (1/u_{char})^2 / (\Sigma(1/(u_{char})^2))$	
CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{its} + u^2_{ts})^{3/2}$	CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/4}$
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
u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty	ubb = bottle to bottle homogeneity standard uncertainty
ults = long term stability standard uncertainty (storage)	utte = long term stability standard uncertainty (storage)

### 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.

ute = transport stability standard uncertainty

### 4.1 Thermometer Calibration

uts = transport stability standard uncertainty

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

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

July 07, 2022

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

### 11.2 Lot Expiration Date

- July 07, 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

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Thomas Kozikowski Manager, Quality Control DD978hi.

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

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

www.absolutestandards.com



## Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

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Part # 58024



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

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	==	Sn	Tm	Ħ	ᄇ	급	176			
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(I)= larget analyte

## Physical Characterization:

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

Certified by:

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

the preparation of all standards.

\* All standard containers are meticulously cleaned prior to use.

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

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

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

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

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



## Certified Reference Material CRM

M5697 B: 10/27/23

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

CERTIFIED WEIGHT REPORT:	l=						Lot #	Solvent:						L:
Pe	Part Number: Lot Number: Description:	O look life	58029 102523 Copper (Cu)	9			24002546	Nitric Acid				M		
							2.0%	40.0	Nitric Acid	Formulated By:	šy:	Benson Chan	102523	
Exp	Expiration Date:		102526	2				(mL)		,	0	D		
Nominal Concentration (µg/mL):	ion (µg/mL):	<u></u> >	1000	S						M	N	tento		
NIST T	NIST Test Number:	0	втв		5E-05	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	102523	
Volume sh	Volume shown below was diluted to (mL):	diluted	1 to (mL):	2000.02	0.058	Flask Uncertainty	ч							ū
										Expanded		SDS information	tion	
Compound	Z	Part	Lot	Dilution	Initial Vol. (ml.)	Uncertainty Pipette (ml.)	Nominal	Initial	Final	Uncertainty	(Solv	(Solvent Safety Info. On Attached pg.)	Attached pg.)	NIST
					von (mr.)	son (min) s species (min)	Const. (Agy ann)	Course (Jage cont.)	Course (hgy min.)	the Organization	COLON	(1117)	E-30	Civia
Copper(II) nitrate trihydrate (Cu)		58129	100223	0.1000	200.0	0.084	1000	10000.1	1000.0	20	10031-43-3	1 mg/m3	ori-rat 794 mg/kg	3114
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1.027														
m/z->	210		220	230		240	250	260						

www.absolutestandards.com

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

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	<0.02	<b>∆</b> 0,02	<b>∆</b> 0.02	<0.02	∆0.02	<b>∆</b> 0.02	<b>40.02</b>		

### 1.1

### Physical Characterization:

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

### Certifled by:

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

  \* 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).

ırt # 58029

2 of 2

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

www.absolutestandards.com



## Certified Reference Material CRM

M5648 8: 10/23/23

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

CERTIFIED WEIGHT REPORT: 1. Manganese(II) nitrate tetrahydrate (Mn) Compound Nominal Concentration (µg/mL): m/z-> m/z-> M/Z-V 5.OE7 1.0≣8 5.0厘7 1,0E8 2.5E6 5.0E6 Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: [1] Spectrum No.1 Lot Number: Description: 110 210 0 58125 Number Part 58025 102623 **BTUB** 1000 Ambient (20 °C) 102626 Manganese (Mn) 071123 120 Number 20 Ĕ [ 34.243 sec]:57025.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 30 Vol. (mL) Pipette (mL) Conc. (µg/mL) 300.0 0.058 5E-05 Initial Flask Uncertainty Balance Uncertainty 240 140 Uncertainty 40 0.084 24002546 Nominal 2.0% Lot # 1000 250 150 00 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid Solvent: 10000.1 Initial <u>a</u> 60.0 260 160 00 Nitric Acid 1000.0 Final 170 0 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Expanded <u>2</u> 180 80 20694-39-7 CAS# (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) 90 Pedro L. Rentas Benson Chan SDS Information 5 mg/m3 200 100 ort-rat >300mg/kg P50 102623 102623 3132 SRM

Printed: 10/26/2023, 1:20:32 PM



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

	4	3	1	3	,	3	2	7	5	3	Z	3	Ş	3	A	3	?	3	<b>7</b>
& 20.02	Zn	40.02	Sa	<b>∆</b> .02	S	<0.02	Sm	40.02	7	<b>6.02</b>	Mo	<b>6.02</b>	L	<0.02	ද	40.02	S	<b>60.02</b>	Bi
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						J/mL)	in Chi	by ICP-N	נוסח	Verifica	letals	I race N							Γ
								950											

### 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 balances that are calibrated with weights traceable to NIST (see above).
- \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All standards should be stored with caps tight and under appropriate laboratory conditions.

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

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CERTIFIED WEIGHT REPORT



Certified Reference Material CRM

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

R:8/25) Lot # Solvent:

21110221

Nitric Acid

Part Number: Description: Lot Number: 58029 071723 Copper (Cu)

Recommended Storage: **Expiration Date:** Ambient (20 °C) 071726 2.0%

(mL)

40.0

Nitric Acid

Formulated By:

Benson Chan

071723

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): **NIST Test Number:** 1000 **BTU9** 2000.02 0.058 5E-05 Flask Uncertainty Balance Uncertainty Reviewed By: Pedro L. Rentas

Part

Lot

Dilution

Initia

Uncertainty

Nominal

Initial

 Copper(II) nitrate trihydrate (Cu) 58129 022723 0.1000 200.0 0.084 1000 10000.5 1000.0 2.2 10031-43-3 1 mg/m3 ori-rat 794 mg/kg

Number Number Factor Val. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LDSO 3114 SRM

Final Uncertainty Expanded (Solvent Safety Info. On Attached pg.) SDS Information TSIN

071723

5.0E5 1.0E6 [1] Spectrum No.1 [ 33.422 sec]:58029.D# [Count] [Linear]

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

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	11	Sn	Im	Ħ	∄	7	4.			
	40.02	40,02	40,02	40.02	<0.02	40.02	<0.02			
	Zr	Z	Υ	۲ <del>۵</del>	<	<b>4</b>	W	STANDARD STANDARD		
	<0.02	40.02	<0.02	<0.02	40.02	<0.02	<0.02			

(I) = larget analyte

### Physical Characterization:

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

Certified by:

2 of 2

<sup>\*</sup> 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.

<sup>\*</sup> 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.

<sup>\*</sup> 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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## M5768 [M576] (B) R:1/3/24 Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: Magnesium nitrate hexahydrate (Mg) IN030 марозгозат Compound Nominal Concentration (µg/mL): m/z-> ~-z/m m/z-> Weight shown below was diluted to (mL): Recommended Storage: 2.0≡4 1.OE4 5.0E5 1.0E6 1000 2000 NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 쭕 **BTU9** 58112 091823 10000 Ambient (20°C) (M5+18), (M5+16) 091826 Magnesium (Mg) Number 120 ğ 20 [ 19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.02 0.058 Flask Uncertainty 10000 Nominal 130 230 30 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) (%) 140 0.10 240 40 Solvent: 24002546 Nitric Acid 8.51 150 234.9118 Weight (g) Target Lot # Ē Weight (g) Conc. (µg/mL) 234.9126 Nitric Acid Actual 160 260 0 10000.0 Actual 170 6 +/- (µg/mL) Expanded Uncertainty Reviewed By: Formulated By: 20.0 180 80 13446-18-9 (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 Pedro L. Rentas Lawrence Barry 190 **SDS Information** Ö Z 200 100 orl-rat 5440 mg/kg 3131a 091823 091823 SRM

### 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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(T) = Target analyte

## Physical Characterization:

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

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



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

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

24002546 Nitric Acid

2.0% (IE)

Nominal Concentration (µg/mL):

NIST Test Number:

BTU<sub>9</sub> 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

**Expiration Date:** 

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

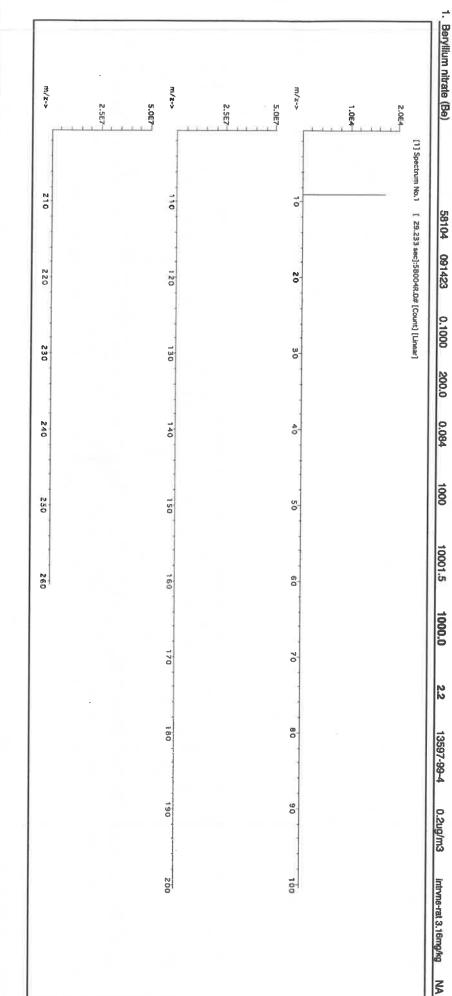
102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

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





800-368-1131



## Certified Reference Material CRM

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

							Trace M	etals	Verificat	cation	by ICP-M	(J) SI	ua/mL)						
	TATES AND AND		District Color	ACCOUNTS OF		STATE OF	STATISTICS OF THE PARTY.	SOMETHINGS.	STATE OF STATE OF	SAMOOGE STATE	SECOND SPIRES	None and a	. 18						
F	<0.02	3	<0.02	Ďλ	<0.02	HL	<0.02	Li	<0.02	z	<0.02	Ā	<0.02	Se	<0.2	T.	<0.02	M	<0.02
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Ba	<0.02	ర	<0.02	3	<0.02	ㅂ	<b>40.02</b>	Mn	<0.02	2	<0.02	8	<0.02	Z	40.2	Ħ	<0.02	2	<0.02
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æ	<0.02	ರೆ	<0.02	Au	<0.02	£	<b>40.02</b>	PK	<0.02	M	<0.2	S	<b>40.02</b>	Ta	<0.02	F	<0.02	Z	<b>40.02</b>

(T) = Target analyte

### Physical Characterization:

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

### Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

<sup>\*</sup> The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

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

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

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

1224



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## CERTIFIED WEIGHT REPORT:

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

Salvents: 21110221

Nitric Acid Hydrochloric acid

Lot #

22D0562008

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

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

1. Ammonium hexafluorostannate(IV) (Sn)

IN010 SND042023A1

1000

0.10

44.2

1.13107

1.13286

RM#

Number

Conc. (µg/mL) Nominal

(%)

Uncertainty Assay
Purity (%) (%)

Weight (g) Target

Actual

ρţ

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> 10.0 30.0

3 6%

Nitric Acid

Formulated By:

Benson Chan

071123

Hydrochloric acid

Reviewed By:

071123

Pedro L. Rentas

Expanded

Weight (g) Conc. (ug/ml.) 1001.6 Actual +/- (µg/mL) Uncertainty 2.0 CAS# SDS Information
(Solvent Safety Info. On Attached pg.)
LD50 7 mg/m3 ₹ SRM

3161a

m/z-> ---X/m --Z/111 2.5E4 5.0E4 1.0ES 2.0E6 2.5E5 S.OEG [1] Spectrum No.1 210 110 0 120 220 N [ 15.034 sec]:58150.D# [Count] [Linear] 230 130 8 240 140 40 250 150 Ö 160 260 60 170 70 180 80 190 90 200 100

Part # 57050



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

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

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(I) = larget analyte

## Physical Characterization:

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

Certified by:

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

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

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

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Certified Reference Material CRM

R: 02109124





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

						TANK BURNE	10000	CHICAGO CONTROL CONTRO	URCH LABILLY	ianioc)	(Solvent Safety Into, On Attached pg.)	ttacned pg.)	202
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL) C	conc. (ug/ml.)	Conc. (µg/mL)	Conc. (ug/ml.)	+/- (ng/mL)	CAS#	Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)	1050	SRM
Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0	58127	050923	0.1000		0.084	1000	10000	100001 100001	9.0	10008.000	000		
							2,000		7:5	100c0-22-9	O.UZ ING/IRIS	STEE SOCIETY OF ING/IIIS OFF-181 Mg/Kg 3113	3113
Spec	N Ent	1.0	0 5000 PE	CAN-LOG	THE REAL PROPERTY.	[1] Spectrum No.1 F at 104% page 1000 [1]							

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		-0 -0		120	
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		9		150	
	PRO-ambanentalan kalanda ka	<u>.</u>		160	
				160	
		20		170	
		80		180	
		08		0001	
		100		800	

Lot # 091923

250

240

230

220

010

W/Z->

## Certified Reference Material CRM





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

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

							Trace M	etals	Verifical	tion	by ICP-M	4S (F	ig/mL)						
1							STREET, STREET	No section lives	ALL DESCRIPTION OF THE PERSON	10.000	Market Mark	MINNSH.	San Salar Salar	NAME OF TAXABLE PARTY.	Service of the last	SECOND STATES		THE PERSON NAMED IN	STREET, SQUARE,
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ౙ	<b>40.02</b>	రే	<b>40</b> 7	占	<0.02	H9	<0.02	.3	₹005	Ź	₹0.02	2	<0.02	Š	40.02	T <sub>e</sub>	40.05	ם	40.02
As	<b>Q</b> 5	ප	40.02	呂	<b>40.02</b>	ų	<0.02	Mg	10.05	ő	₹0.02	뙲	<0.02	Ag	<b>40.02</b>	F	<0.02	>	Ø.02
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(T)= Target analyte

### Physical Characterization:

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



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



Lot # 091923

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.

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

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## Certified Reference Material CRM

M5801



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

CERTIFIED WEIGHT REPORT: 1. Arsenic (As) Compound Nominal Concentration (µg/mL): M/2-> m/z-> -z/m 5.OE4 2.5E4 Recommended Storage: 1.0E5 2.0日5 1000 Volume shown below was diluted to (mL): 500 **NIST Test Number: Expiration Date:** Part Number: Description: Lot Number: [1] Spectrum No.1 210 110 0 58133 Number Part **SUTB** 1000 111326 57033 111323 Ambient (20 °C) Arsenic (As) 020522 Number 120 D D ONN NO [ 34.433 sec]:57033.D# [Count] [Linear] 0.1000 4000.0 Dilution Factor 230 130 30 Vol. (mL) 5E-05 400.0 initial 0.06 Pipette (mL) Conc. (µg/mL) Flask Uncertainty Balance Uncertainty Uncertainty 240 140 40 0.084 24002546 Nominal 2.0% Lot # 100 250 160 50 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid 10001.0 Solvent: Initial 80.0 260 160 60 Nitric Acid 1000.0 Fina 170 0 Formulated By: Reviewed By: +/- (µg/ml.) Uncertainty Expanded 2.0 180 Thomas 80 7440-38-2 (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) Pedro L. Rentas Lawrence Barry 90 SDS Information 0.5 mg/m3 100 000 orl-rat 500 mg/kg LD50 111323 111323 3103a NIST SRM

Printed: 2/8/2024, 5:01:04 PM

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

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### Physical Characterization:

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

Certified by:



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

R102109124

MURIC

Solvent: 21110221

Nitric Acid

Lot #

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

CERTIFIED WEIGHT REPORT:

Part Number: **Lot Number:** 

57115 041723

Description:

Phosphorous (P)

**Expiration Date:** 

041726

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

**BTUB** 

5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 2000.02

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

1. Ammonium dihydrogen phosphate (P)

IN008 PV082019A1

10000

99,999

0.10

27.5

RM#

Compound

22%

40.0

Nitric Acid

Formulated By:

Lawrence Barry

041723

into

Reviewed By:

Pedro L. Rentas

Expanded SDS Information 041723

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

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

Part # 57115

1 of 2

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

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(I)= larget analyte

### Physical Characterization:

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

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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2 of 2

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### R1 02/09/124 Certified Reference Material CRM

M5816

CERTIFIED WEIGHT REPORT

Part Number:

Lot Number: Description:

57016 122923

Solvent:

122923

**ASTM Type 1 Water** 

Lot #

**Expiration Date:** 122926 Sulfur (S)

Nominal Concentration (µg/mL): NIST Test Number: 1000

Recommended Storage:

Ambient (20 °C)

Weight shown below was diluted to (mL): 4000.0 5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Nominal

Purity

Uncertainty Assay

Target

Actual

Uncertainty

Expanded

Reviewed By:

Pedro L. Rentas

122923

tento

Formulated By:

Benson Chan

122923

 Ammonium sulfate (S) IN117 SLBR7225V <del></del> Number Conc. (µg/mL) 1000 99.9 38 Purity (%) 0.10 24.3 38 Weight (g) 16.4979 Weight (g) Conc. (µg/mL) 16.4980 1000.0 +/- (µg/mL) 20 7783-20-2 CAS# SDS Information
(Solvent Safety Info. On Attached pg.)
LD50 ¥ orl-rat 4250mg/kg 3181 SRM

1/Z-V m/z-> m/z-> N.SES S.OEB 5.OE7 1.0**E**8 N. SES 5.0E5 [1] Spectrum No. 1 210 110 0 120 ななり 0 [ 33.603 sec]:57016.D# [Count] [Linear] 130 230 30 140 240 40 250 150 000 160 200 00 170 0 180 80 190 00 200 100

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

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

(I) = larget analyte

### **Physical Characterization:**

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

Certified by:

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Certified Reference Material CRM

109/24

M5817

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 071123 57116

Solvent:

071123

**ASTM Type 1 Water** 

Burense

Formulated By:

Lawrence Barry

071123

Lot #

**Expiration Date:** Description: 071126 Sulfur (S)

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

Recommended Storage:

EU1B

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

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

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

Expanded

071123

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

m/z->	1.005	m/z-> 2.0E5	2.5E5	5.0E5	1000	2000
0		110		0		
N N O		120		20		
230		130		<b>3</b> 0		
24		140		40		
250		150		50		
260		190		8		
		170		70		
		180		8.		
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# Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):

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Physical Characterization:

(1)= larger analyte

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

Certified by:

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Certified Reference Material CRM

109/24

Solvent: 24002546 Nitric Acid

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

CERTIFIED WEIGHT REPORT: M.5818

Part Number: Lot Number: Description: 57014 122023 Silicon (SI)

**Expiration Date:** 122026

2%

Nitric Acid

Formulated By:

Aleah O'Brady

122023

Areah o Brash

Reviewed By:

Pedro L. Rentas

122023

SRM

Œ. 40.0

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

Weight shown below was diluted to (mL): 1999.48 5E-05 Balance Uncertainty

0.058 Flask Uncertainty

	11 -
Ammonium hexafluorosilicate (Si)	Compound
10009 :	RM#
SID082022A1	Lot
IN009 SID082022A1 1000 99.999 0.10 14.4 13.8854 13.8855	Lot Nominal Purity Uncertainty Assay Number Conc. (µg/mL) (%) Purity (%) (%) W
99.999	Purity (%)
0.10	Uncertainty Purity (%)
14.4	Assay (%)
13.8854	Target Weight (g)
13.8855	Actual Weight (g)
1000.0	Actual Conc. (µg/mL)
2.0	Expanded Uncertainty +/- (µg/mL)
16919-19-0	(Solven
1000.0 2.0 16919-19-0 2.5 mg/m3	Expanded  Actual Uncertainty (Solvent Safety Info. On Attached pg.)  Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50
orl-mus 70 mg/kg	on Attached pg.)

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Part # 57014

Lot # 122023



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

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(T) = Target analyte

## **Physical Characterization:**

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

Certified by:

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

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Certified Reference Material CRM

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Solvent: 24002546

Nitric Acid

F Lot #

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: 58030

Description:

111623 Zinc (Zn)

Ambient (20 °C) 111626

**Expiration Date:** 

Nominal Concentration (µg/mL): Recommended Storage:

**NIST Test Number:** 

**BTU9** 1000

5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Weight shown below was diluted to (mL):

3000.4

5

Nominal

Purity

Uncertainty Assay

Target

Actual

Actual

Uncertainty

Expanded

84 60.0 <u>a</u>

Nitric Acid

Formulated By: Benson Chan

111623

Reviewed By: Pedro L. Rentas

111623

Zinc nitrate hexahydrate (Zn) Compound [1] Spectrum No.1 [ 31.103 sec]:58130.D# [Count] [Linear] IN016 ZNE032021A1 RM# Number Conc. (µg/ml.) 1 000 99.999 8 Purity (%) 0.10 24.3 3 Weight (g) 12.3475 Weight (g) Conc. (µg/ml.) 12.3502 1000.2 +/- (µg/mL) 2.0 10196-18-6 CAS# OSHA PEL (TWA) orl-rat 1190mg/kg 3168



(Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 **SDS** Information SRM SRM

200

100

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

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(I) = larget analyte

## Physical Characterization:

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Certified by:

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

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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Lot #

Part Number: Lot Number: Description: 57015 091123 Phosphorous (P) Solvent: 24002546 2% 40.0 Nitric Acid Nitric Acid

Formulated By:

Lawrence Barry

091123

Pedro L. Rentas

091123

**SDS** information

rento

Nominal Concentration (µg/mL): Recommended Storage: **Expiration Date:** 1000 091126 Ambient (20 °C) (JE)

Weight shown below was diluted to (mL): **NIST Test Number:** BITUB Lot 2000.02 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Actual Uncertainty Reviewed By: Expanded

 Ammonium dihydrogen phosphate (P) IN008 Pvos2018A1 [1] Spectrum No.1 RM# Number [ 12.074 sec]:58115.D# [Count] [Linear] Conc. (µg/mL) 1000 99.999 3 Purity (%) 0.10 27.5 3 Weight (g) 7.2729 Weight (g) Conc. (µg/mL) 7.2730 1000.0 +/- (µg/mL) 2.0 7722-76-1 CAS# (Solvent Safety Info. On Attached pg.)
# OSHA PEL (TWA) LD50 5 mg/m3 rl-rat >2000mg/ki 3186 SRM

Part # 57015

--z/m

210

220

230

240

250

260



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

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

	ľ	В	<u> </u>	Ħ.	뮸	200	Ę,	3		ş	2	4		
		A 022	20.02	3	- 60 10	70.02	3	70		<b>A</b>	2002	200		
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	2000	3	<u> </u>	4.4	3	<b>∆</b> 02		<b>6</b> 002	20.02	3	40.02	-		Trace M
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Target	ŀ	4	7	7	,	Z	Ş	Ş	8		Z			†: 
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	40.02	70.02	3	<b>∆</b> 0,02	i d	3	20,02	3	<b>∆</b>	ć	3			
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	<b>40.02</b>	70.02	3	<b>∆0,02</b>	2000	3	<b>∆</b> 0.02	2	200	20.02	300			
	Zr	2	7	<u>~</u>	16	\$	\ -		9	*				
	40.02	20.02	3	20.02	70.0>	3	<u></u>		A) (2)	20.02				

### Physical Characterization:

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

Certified by:

- \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. 
  \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- \* All standard containers are meticulously cleaned prior to use.
- \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All Standards should be stored with caps tight and under appropriate laboratory conditions.

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

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



Certified Reference Material CRM

Lot #

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

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

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

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

= larget analyte

### Physical Characterization:

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

Certified by:

<sup>\*</sup> 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.

<sup>\*</sup> All standard containers are meticulously cleaned prior to use.

<sup>\*</sup> Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

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

<sup>\*</sup> All standards should be stored with caps tight and under appropriate laboratory conditions.

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

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



## Certified Reference Material CRM

M5962 R! 06/14/24



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

m/z->		i,	m/z->		10 c	÷ is	1. Selenium (Se)	Compound		<		Nominal Co	Re			CERTIFIED WEIGHT REPORT	מדודודה שובום
210	1.008	2.008	110	1.008	/z-> 10	[1] Spectrum No.1				Volume shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Recommended Storage:	1	Lot Number: Description:	Part Number:	1 11000H
0			0		Ū	Z	58134	Number	Part	as dilute					in in in	_	
220			120		N 0	r.	071223	Number	Lot	d to (mL):	6UTB	1000	Ambient (20 °C)		060624 Selenium (Se)	57034	
Ŋ			<u></u>		ω	3.702	0.1000	Factor	Dilution	2000.07			<u>೦</u>		Se)		
230			130		90	sec]:58	200.0	Val. (mL	Initial	0.100	5E-05						
240			140		40	33.702 sec]:58034.D# [Count] [Linear]	0.084	Vol. (mL) Pipette (mL) Conc. (µg/mL)	Uncertainty	Flask Uncertainty	Balance Uncertainty						
250			150		50	Count) [L	1000	Conc. (µg/mL)	Nominal	ťγ	ainty			2.0%	24007540	24002546	
260			160		. 60	inear 2	10002.5	Conc. (µg/mL	Initial				(mL)	40.0	No.	Solvent:	
o							1000.0	Conc. (µg/mL) Conc. (µg/mL)	Final					Nitric Acid			(1)
			170		70		2.2	.) +/- (µg/mL)	Uncertainty	Expanded	Reviewed By:	K	N	Formulated By:	M		10
			180		80		7782-49-2	C	(So		y:	200	11	Ву:			
			190		90		2 0.2 mg/m3	OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)	SDS Information	Pedro L. Rentas	lenco		Benson Chan	M		
			200		100			NA)	). On Atta	rmation	ntas	,	/	5			
			-		J		orl-rat 6700 mg/kg	LDS0	ched pg.)		060624			060624			
							3149	SRM	NIST		4			4-1		_	

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

							I race M	1etals	Verifica	lion	oy ICP-M	S (1)	g/mL)						
Al	40.02	CG	<0.02	Dγ	<0.02	HH	<0.02	11	<0.02	Z.	<0.02	Pr	<0.02	Se	H	16	40.02	W	40,02
SЪ	<0.02	ದ್ದ	<0.2	퍜	<0.02	н	<0.02	Į	<0.02	₽	<0.02	Re	40.02	S:	<0.02	Te	<0.02	U	<0.02
As	<0.2	ಕಿ	<0.02	핃	<0.02	Ħ	<0.02	Mg	<0.01	°	<0.02	Rh	40.02	Ag	<0.02	∄	40.02	۷	<0.02
Ва	<0.02	င္တ	<0.02	æ	<0.02	ŀ	<0.02	Mn	<0.02	Pd	40.02	₽.	<0.02	Na	<0.2	Ħ	<0.02	ታ	<0.02
Ве	40.01	ť	40.02	Ga	<0.02	F	<0.2	Hg	A02	P	<0.02	Ru	40.02	Sr	<0.02	Tm	<0.02	¥	<0.02
Bi	40.02	င္ပ	<0.02	ଦୁ	<0.02	Ľ	<0.02	Mo	<0.02	7	<0.02	Sm	40.02	S	<0.02	Sn	40.02	Zn	<0.02
В	<0.02	Cι	<0.02	Au	<0.02	Рь	<0.02	M	<0.02	×	40.2	Sc	<0.02	Ta	<0.02	Ħ	<0.02	Z	<0.02

(T) = Target analyte

### Physical Characterization:

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

Certified by:

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

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

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

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

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



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

info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 **PRODUCT DESCRIPTION**

**Product Code:** 

Single Analyte Custom Grade Solution

Catalog Number:

CGMO1

Lot Number:

T2-MO720876

Matrix:

**H2O** 

tr. NH40H

Value / Analyte(s):

1 000 µg/mL ea:

Molybdenum

Starting Material:

Ammonium Molybdate

Starting Material Lot#:

2361

Starting Material Purity: 99.9893%

### 3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Value:** 

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

Density:

1.000 g/mL (measured at 20 ± 4 °C)

### Assav Information:

Assay Method #1

998 ± 4 µg/mL

ICP Assay NIST SRM 3134 Lot Number: 130418

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

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

### Characterization of CRM/RM by Two or More Methods

Certified Value, X<sub>CRWRM</sub>, 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<sub>i</sub> = mean of Assay Method : with standard uncertainty uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

u<sub>(s</sub> = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mean of individual results;

X<sub>CRM/RM</sub> = (X<sub>a</sub>) (u<sub>char a</sub>)

X<sub>a</sub> = mean of Assay Method A with

ucher a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

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

### 6.0 INTENDED USE

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

### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

### 7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  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 - 95.94 +6 6,7,8,9 [MoO4]-2(chemical form as received)

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

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

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

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

### 11.1 Certification Issue Date

July 17, 2022

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

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

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

Uyen Truong Supervisor, Product Documentation

Meyer Trusing

### **Certificate Approved By:**

Michael Booth Director, Technical Michael 2 Booth

### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director Paul R Saine

### Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



### ACCREDITATION / REGISTRATION

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

### PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

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

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

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

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

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

Assay Information:

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

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

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization is used is the mosn of individual results:

 $(x_0) \ (x_0) \ (x_0$ 

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

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

4.0 TRACEABILITY TO NIST

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

### 4.2 Balance Calibration

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

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

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

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

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

Page 2 of 4

INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

> uR M 882000.0

> 9A M 886 0.000.0

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

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

> iN O 882000.0 > sO M 841200.0

> dN O 322500.0 > N M 862000.0

M - Checked by ICP-MS

Mn < Mg < Li <

> 0H

> 6H

ΉŁ

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

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

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

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

> 6T M 882000.0 > AT M 882000.0

sT M 034450.0 > dT M E70100.0

s 853000.0 M 882000.0

O 69Z000'0

O.043560 O

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

> II

JS

674000.0 228610.0

892000.0 892000.0

0.000268

699630.0

0.001341

892000.0

0.010560

960000'0

960000.0

73260.0 > nZ O 402100.0 038540.0 > nZ O 267400.0

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

7.7 Storage and Handling Recommendations

oM M 882000.0

0.000268 M K 0.000268 M K 0.000268 M K

0.000872 O Fe > 0.008586 M Ga <

O 892000.0

O S37000.0 M 882000.0

M 882000.0

M 603100.0

M 885800.0

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

INTENDED USE

W Et < O Cn <

O B <

IA O

### 4.1 Thermometer Calibration

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

### Page 3 of 4

- Chemical Testing - Accredited / AZLA Certificate Number 863.01

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

- QSR Certificate Number QSR-1034

1.01 ISO 9001 Qualify Management System Registration

### MOITATY STANDARD DOCUMENTATION 0.01

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

This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. The Coth series alongs mirranamed to be homogeneous.

### HOMOGENEITY

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

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

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

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

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

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

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

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

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

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

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

- Store between approximately  $4^{\circ}$  - 30° C while in sealed TCT bag.

Page 4 of 4

Chairman / Senior Technical Director

- Sealed TCT Bag Open Date:

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

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

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

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

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

Thomas Kozikowski Manager, Quality Control Certificate Approved By:

thibils Validity

- June 17, 2027 11.2 Lot Expiration Date

June 17, 2022 11.1 Certification Issue Date

Paul Gaines Certifying Officer:

0.Sr

0.11

CERTIFIED WEIGHT REPORT:

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



## K S981 Reference Material CRM R S981







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

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

1.0E6	5.0E5	m/z-> 5.0E4	2.5E4	m/z-> 1.0E6	S.OES	\.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
[1] Spectrum No.1		0		011		C
		O		120		000
[ 23.264 sec]:57092.D# [Count] [Linear]		Og		130		.0
7092.D <b>*</b> [C		0		140		
ount] [Line		80		081		
ar]		O e		160		
		, 2		170		
		99		-@ -		
		Oe		081		
		100		200		

Lot # 060724





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

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

	Se         <0.2
(µg/mL)	Pr
-MS	
by ICP	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
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Trace M	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
П	35255
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	ទី១១១១១១
	40.02 40.02 40.02 40.02 40.02 40.02
	B Ba Ba

(T) = Target analyte

### Physical Characterization:

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





2 of 2

<sup>\*</sup> 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.

<sup>\*</sup> Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).

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

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

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

CERTIFIED WEIGHT REPORT:

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



## Certified Reference Mater



fied Refe	rence Mai	fied Reference Material CRM	C		ANAB IS AR-153 https://ab	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	dited
¥	Z #107	7	2	2/11/0	<b>&gt;</b>		
Solvent:	Solvent: 24002546 Nitric Acid	Nitric Acid		A CONTRACTOR OF THE PARTY OF TH			
2%	40.0	Nitric Acid		Formulated By:	Benson Chan	031524	
	(III)			Ja Ja	Hento		
Uncertainty				Reviewed By:	Pedro L. Rentas	031524	

Part Number: Lot Number:		19		Solvei	Solvent: 24002546 Nitric Acid	46 Nitr	ic Acid		A STATE OF THE STA	1		
Description:	Strontium (Sr)	(Sr)		C)	2% 40.0		Nitric Acid	, Itt	Formulated Bv:	Benson Chan	8	031524
Expiration Date:	031527							L	7	1		
Recommended Storage:	Ambient (20 °C)	(2)							1	A Comment of the Comm	1	
Nominal Concentration (µg/mL):	1000								June 1	Kena	΄ Δ	
NIST Test Number:	6UTB		5E-05 Ba	5E-05 Balance Uncertainty	<u>~</u>			Œ	Reviewed By:	Pedro L. Rentas		031524
Weight shown below was diluted to (mL); 2000.07	as diluted to (mL):	2000.07	0.100 Fla	0.100 Flask Uncertainty				I				
									Expanded	SDS Information	mation	
	Lot	Nominal	Purity U	Nominal Purity Uncertainty Assay	say Target		Actual Act	Actual U	Uncertainty	(Solvent Safety Info. On Attached pg.)	On Attached pg.)	TSIN
Compound	RM# Number Conc. (µg/mL) (%) Purity (%) (%)	Conc. (ug/mL)	(%)	urity (%) (9	6) Weight (g)		Weight (g) Conc. (µg/mL) +/- (µg/mL)	ug/mL) +	-/- (ug/mL) CAS#	# OSHA PEL (TWA)	NA) LD50	SRM

1. Strontium nitrate (Sr)		IN017 SRZ022018A1	1000	89.997	0.10	41.2	4.85470	4.85502	1000.1	2.0	10042-76-9	NA	orl-rat >2000mg/kg 3153a
5.0EG	[1] Spect	[1] Spectrum No.1	[ 14.495 sec]:58138.D# [Count] [Linear]	sec]:581	38.D#	Coun	nt] [Linea						
2.5E6												-90-000 Market Market	
m/z->⊶ 1.0E6	•	10 20		OG	0		.00	09	0,		80	. <u>0</u>	100
5.0ES	unggap a militing di danggap kili. Ayaka sakair bi												
m/z-≫ 5.0E6		110 120		130	041		150	160	0.71		180	081	200
2.5E6													
V-z/H	4	220		230	240	14	250	260					



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

	THE SHAPE OF THE S	<0.02	200	200	2 2	200	3 8	3 5
	Name of the last	W	1	->	- <del>K</del>	· >	Z,	1 2
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by ICP-I	Married Scin	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	40.5
ition		ž	ź	ő	몺	Д	ፈ	M
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stals		3	5	Mg	Mn	Hg	Wo	ğ
race Me		<0.02	<0.02	<0.02	<0.02	40.2	<0.02	<0.02
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	NAME OF STREET	<0.02	<0.02	<0.2	<0.02	<0.01	<0.02	<0.02
	Market Market	₹	Sp	As	Ba	æ	B.	В

(T) = Target analyte

### Physical Characterization:

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



Certified by:

Lot # 031524

1. P

1 \*

<sup>\*</sup> The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.

<sup>\*</sup> 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.

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

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

Certified Reference Material CRM

# 5982 R: 6/11/24







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

			Comment Comment of the second	Nitric Acid Formulated By: Benson Chan 071423	7		flesh Mento	Reviewed By: Pedro L. Rentas 071423		Expanded SDS Information	Final Uncertainty (Solvent Safety Info. On Attached pg.) NIST	Vol. (ml.) Pipette (ml.) Conc. (µg/ml.) Conc. (µg/ml.) Conc. (µg/ml.) +/- (µg/ml.) CAS# OSHA PEL (TWA) LD50 SRM
Solvent:	Nitric Acid			40.0	(mL)						Initial	Conc. (µg/mL
Lot #	21110221			2.0%				ainty	£,		Nominal	Conc. (µg/mL)
								Balance Uncertainty	Flask Uncertainty		Uncertainty	Pipette (mL)
								SE-05	0.058		Initial	Vol. (mL)
			(Zr)			(),(			2000.02		Dilution	Factor
	57040	071423	Zirconium (Zr)		071426	Ambient (20 °C)	1000	6UTB	id to (mL):		Lot	Number
									was dilute		Part	Number
CERTIFIED WEIGHT REPORT:	Part Number:	Lot Number:	Description:		Expiration Date:	Recommended Storage:	Nominal Concentration (µg/mL):	NIST Test Number:	Volume shown below was diluted to (mL):			Compound

1. Zirconyl chloride octahydrate (Zr)	ctahydrate (Zr)	58140	58140 070621	0.1000	200.0	0.084	1000	10000.3 1000.0		2.2	13520-92-8	NA A	NA	NA A
1.056	[1] Speatrum No.1	ofrum A		[ 41.153 sec]:57040.D# [Count] [Linear]	ec]:570	40.0*	Count (L	inear]						
8.0E6	Đ W											***************************************		
7.5/m ₹-5/0	8	ō.	0 N	OR		0	9	0	0		0	0	00	
6.0E7	<b>L</b>													
1.0E8	0	011	0 25 0	130		0	180	160	170	۳	081	190	500	
6.0E7	K W													
~-2/4		0	220	230		240	250	260						

Lot # 071423



## 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):

			ger.		_	-	_	-		_	-		
				2002	7000	₹0.05	5	70:05	<b>20</b> 00		<0.02	<b>20.02</b>	€
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				8	8	70:05	200		97	8	70.05	Ø.02	<b>40.02</b>
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	(m)			Z0'02	2007	70.0	<b>\$005</b>	5	70:05	200		70:05	₹0.02
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	V ICP-MS	CONTRACTOR OF THE PERSONS	8	70.02	200		40.02 40.02	5	70.02	<b>₹</b> 0.02	5	70:05	<b>40.2</b>
	ion b	ı	Į.	= =	ź		5	70	2	<u>Д</u>	Ā	1 1	*
	Verificat		60.02	70:04	<b>₹</b> 0.02	9	<0.01	200		<b>40</b> 2	2002	70:05	<0.02
I	stals		E	i	5	7,7	Mg	M.		20	×		DN
	Trace Me		<0.00	-	Ø.02	5	70:02	<b>20.02</b>		97	<0.02		Z0:0>
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(T) = Target analyte

### Physical Characterization:

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

### Certified by:

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

\* All standard containers are meticulously cleaned prior to use.

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

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

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







Printed: 6/7/2024, 3:58:47 PM

Lot # 071423

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



### R; 01/03/24 M6033 Certified Reference Material CRM

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

m/z->	1.0E6	2.016	m/z->	N :0 III 0	O T O	m/z-y	2.5E5	5.0E5	7	1. Aluminum nitrate nonahydrate (AI)	Compound	Weight shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (ug/mL):	Expiration Date:		Des	Part	CERTIFIED WEIGHT REPORT:
210			110			10			[1] Spectrum No.1	1	RM#	below was dilut	Number:	(µa/mL):	Expiration Date:		Description:	Part Number:	
220			120			20			_	IN022 ALM112021A1	Lot Number Co		6UTB	10000	011626 Ambient (20 °C)		Aluminum (AI)	011623	
230			130			30			[5.014 sec]	10000 99.999	Nominal Purity Conc. (µg/mL) (%)	2000.02 0.05	5E-0	,	ب.		AL)		
240			140			40			15.014 sec]:58113.D# [Count] [Linear]	9 0.10 7.30	Purity Uncertainty Assay (%) Purity (%) (%)	0.058 Flask Uncertainty	5E-05 Balance Uncertainty			Ŋ		Solvent:	1
250			150			50			Count] [Line	30 273.9779	say Target 6) Weight (g)		₹		(mL)	2% 40.0		nt: 20510011	
260			160			60			ear]	274.0078 1	Actual Weight (g) Cor					Nitric Acid		Nitric Acid	
			170			70				10001.1 2	Actual Unce Conc. (µg/mL) +/-		Rev			Forr	7	-C	1
			180			80				20.0 7784-27-2	Expanded Uncertainty (S +/- (µg/mL) CAS#		Reviewed By:	Carlo		Formulated By:	JUDY WILLIAM	アニューン	
			190			90				2 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.)  BY OSHA PEL (TWA)  LD5		Pedro L. Rentas	Rend	N	Giovanni Esposito	6	>	
			200			100					o. On Attached p		las	8		osito	200	STATE OF THE PARTY	
										orl-rat 3671 mg/kg 3101a	pg.) NIST LD50 SRM		011623			011623			

Nitric Acid 69%

Rew. 1 — 08/0/12025 Pare 1 — 16034, M6034 m6035, M6038, m6036, Certificate of Analysis





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

Manufactured Date: 2024-03-26 Retest Date: 2029-03-25

Revision No.: 0

Test	Specification	Result
Assay (HNO <sub>3</sub> )	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 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 >>>





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

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

Nitric Acid 69% CMOS





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

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Jamie Croak
Director Quality Operations, Bioscience Production

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





paper m6039 Certificate of Analysis m6040

Material No.: 9530-33 Batch No.: 24D1562005 Manufactured Date: 2024-03-18 Retest Date: 2029-03-17

Revision No.: 0

Test	Specification	Result
ACS – Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.192
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS - Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS Free Chlorine (as Cl2)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.05 ppm	0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO <sub>3</sub> )	≤ 0.8 ppm	0.3 ppm
Ammonium (NH <sub>4</sub> )	≤ 3 ppm	< 1 ppm
Trace Impurities - Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (AI)	≤ 10.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 10.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 20.0 ppb	2.2 ppb
Trace Impurities - Cadmium (Cd)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	31.0 ppb
Trace Impurities - Chromium (Cr)	≤ 1.0 ppb	0.5 ppb
Trace Impurities - Cobalt (Co)	≤ 1.0 ppb	0.2 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	< 0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 15 ppb	3 ppb

>>> Continued on page 2 >>>





Material No.: 9530-33 Batch No.: 24D1562005

Test	Specification	Result
Trace Impurities - Lead (Pb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Lithium (Li)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities - Magnesium (Mg)	≤ 10.0 ppb	2.2 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities – Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Nickel (Ni)	≤ <b>4.0</b> ppb	0.2 ppb
Trace Impurities – Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	≤ 9.0 ppb	< 1.0 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	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	2.0 ppb
Frace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Frace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Frace Impurities – Thallium (TI)	≤ 5.0 ppb	< 2.0 ppb
Frace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.4 ppb
race Impurities – Titanium (Ti)	≤ 1.0 ppb	0.2 ppb
race Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
race Impurities – Zinc (Zn)	≤ 5.0 ppb	< 0.2 ppb
race Impurities – Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

Hydrochloric Acid, 36.5-38.0%

BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis





Material No.: 9530-33 Batch No.: 24D1562005

Test Specification Result

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

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC





Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

#### 1.0 **ACCREDITATION / REGISTRATION**

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



#### 2.0 PRODUCT DESCRIPTION

Product Code:

Multi Analyte Custom Grade Solution

Catalog Number:

IV-STOCK-12

Lot Number:

U2-MEB734294

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

10 µg/mL ea:

Barium, Bismuth, Cobalt, Lithium.

Lead,

Beryllium, Cerium, Indium,

Nickel. Uranium

#### 3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

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

**Assay Information:** 

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

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

#### Characterization of CRM/RM by Two or More Methods

Certified Value, X<sub>CRMRM</sub>, where two or more methods of characterization are used is the weighted mean of the results:

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

#### Characterization of CRM/RM by One Method

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

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

X<sub>a</sub> = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u<sub>char a</sub> = the errors from characterization

u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty

uits = long term stability standard uncertainty (storage)

u<sub>ts</sub> = transport stability standard uncertainty

#### **Certified Abundance:**

#### IV's Certified Abundance

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

#### 4.0 TRACEABILITY TO NIST

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

#### 4.1 Thermometer Calibration

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

#### 4.2 Balance Calibration

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

#### 4.3 Glassware Calibration

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

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

N/A

#### 6.0 INTENDED USE

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

  <a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. 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

#### 8.0 HAZARDOUS INFORMATION

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

#### 9.0 HOMOGENEITY

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

#### 10.0 QUALITY STANDARD DOCUMENTATION

#### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

#### 11.1 Certification Issue Date

June 21, 2023

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

#### 11.2 Lot Expiration Date

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

#### 11.3 Period of Validity

<ul> <li>Sealed TCT Bag Open Date</li> </ul>	o:

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

#### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

#### Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

#### **Certifying Officer:**

Paul Gaines
Chairman / Senior Technical Director

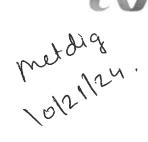
Paul R. Simo

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





M6095.



Material No.: 9530-33 Batch No.: 24D1562005 Manufactured Date: 2024-03-18 Retest Date: 2029-03-17

Revision No.: 0

## Certificate of Analysis

Test	Specification	Result
ACS - Assay (as HCl) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS - Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.192
ACS - Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS - Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS - Free Chlorine (as Cl2)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.05 ppm	0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO <sub>3</sub> )	≤ 0.8 ppm	0.3 ppm
Ammonium (NH <sub>4</sub> )	≤ 3 ppm	< 1 ppm
Trace Impurities - Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities - Aluminum (AI)	≤ 10.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities - Barium (Ba)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 10.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 20.0 ppb	2.2 ppb
Trace Impurities - Cadmium (Cd)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	31.0 ppb
Trace Impurities - Chromium (Cr)	≤ 1.0 ppb	0.5 ppb
Trace Impurities - Cobalt (Co)	≤ 1.0 ppb	0.2 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	< 0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 15 ppb	3 ppb

>>> Continued on page 2 >>>





Material No.: 9530-33 Batch No.: 24D1562005

Test	Specification	Result
Trace Impurities – Lead (Pb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Lithium (Li)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	2.2 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities – Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Nickel (Ni)	≤ 4.0 ppb	0.2 ppb
Trace Impurities - Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Potassium (K)	≤ 9.0 ppb	< 1.0 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	< 0.3 ppb
Trace Impurities - Sodium (Na)	≤ 100.0 ppb	2.0 ppb
Trace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (Tl)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Tin (Sn)	≤ 5.0 ppb	< 0.4 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	0.2 ppb
Trace Impurities - Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	< 0.2 ppb
Trace Impurities – Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

Hydrochloric Acid, 36.5-38.0%

BAKER IÑŚTRA-ANALYZED® Reagent
For Trace Metal Analysis





Material No.: 9530-33 Batch No.: 24D1562005

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



Nitric Acid 69% **CMOS** 

Receive: Avantor





Material No.: 9606-03 Batch No.: 24B1362001

Manufactured Date: 2024-01-25 Retest Date: 2029-01-23

Revision No.: 0

## Certificate of Analysis

Test	Specification	Result
Assay (HNO <sub>3</sub> )	69.0 ~ 70.0 %	69.6 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (AI)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	< 0.2 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	< 50 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 >>>





Material No.: 9606-03 Batch No.: 24B1362001

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities – Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count – 0.5 µm and greater	≤ 60 par/ml	3 par/ml
Particle Count – 1.0 µm and greater	≤ 10 par/ml	1 par/ml

Nitric Acid 69% **CMOS** 





Material No.: 9606-03 Batch No.: 24B1362001

Test

Specification

Result

For Microelectronic Use

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

Sr. Manager, Quality Assurance

Nitric Acid 69% **CMOS** 

Receive: Avantor





Material No.: 9606-03 Batch No.: 24B1362001

Manufactured Date: 2024-01-25 Retest Date: 2029-01-23

Revision No.: 0

## Certificate of Analysis

Test	Specification	Result
Assay (HNO <sub>3</sub> )	69.0 ~ 70.0 %	69.6 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (AI)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities – Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	< 0.2 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	< 50 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 >>>





Material No.: 9606-03 Batch No.: 24B1362001

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities – Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities – Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace impurities – Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count – 0.5 µm and greater	≤ 60 par/ml	3 par/ml
Particle Count – 1.0 µm and greater	≤ 10 par/ml	1 par/ml

Nitric Acid 69% **CMOS** 





Material No.: 9606-03 Batch No.: 24B1362001

Test

Specification

Result

For Microelectronic Use

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

Sr. Manager, Quality Assurance

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

www.absolutestandards.com



# Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

58111 122223

Sodium (Na)

Lot Number: Description:

Nominal Concentration (µg/mL):

**NIST Test Number:** 

**6UTB** 10000

Weight shown below was diluted to (mL):

3000.4

0.06 Flask Uncertainty 5E-05 Balance Uncertainty

RW#

Number Lot

Nominal

Purity

Uncertainty Assay Purity (%)

Target

Actual

8

38

Recommended Storage:

Ambient (20 °C)

122226

**Expiration Date:** 

Lot # M5807

Solvent:

24002546 Nitric Acid

2%

60.0 (III)

Nitric Acid

Formulated By: 13817 P Aleah O'Brady Back

Reviewed By: Pedro L. Rentas

122223

22223

Actual Uncertainty Expanded (Solvent Safety Info. On Attached pg.) **SDS Information** TSIN

CAS#

SE

1. Sodium nitrate (Na) IN036 NAV01201511 Conc. (µg/mL) 10000 98.999 0.10 26.9 111.5406 Weight (g) Weight (g) Conc. (µg/mL) 111.5479 10000.7 +/- (µg/mL) 20.0 7631-99-4 OSHA PEL (TWA) 5 mg/m3 ori-rat 3430 mg/kg 3152a

1 m/z-> 17/z-Y m/z-> N.5E6 5.0E6 2.5E6 5.0E6 2.5E5 5.0E5 [1] Spectrum No.1 210 110 0 220 120 NO. [ 8.935 sec]:58111.D# [Count] [Linear] 130 230 30 140 240 6 150 250 50 160 260 0 170 70 180 80 190 90 100 200

Part # 58111



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

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

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## Physical Characterization:

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

Certified by:

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

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

\* All standard containers are meticulously cleaned prior to use.

\* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). \* Standards are 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
M5738 M5739 M5740 M5741 M5742

Refine your results. Redefine your industry.

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

#### 1.0 **ACCREDITATION / REGISTRATION**

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



#### 2.0 **PRODUCT DESCRIPTION**

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

6020ISS

Lot Number:

S2-MEB709511

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

10 µg/mL ea:

Bismuth,

Holmium,

Indium,

6-Lithium.

Rhodium,

Scandium,

Terbium,

Yttrium

#### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

**ANALYTE** 

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

Bismuth, Bi

Indium, In

10.00 ± 0.04 µg/mL

Holmium, Ho Rhodium, Rh

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

Scandlum, Sc

10.00 ± 0.04 µg/mL

Terbium, Tb

10.00 ± 0.04 µg/mL

Yttrium, Y

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

Density:

1.035 g/mL (measured at 20  $\pm$  4 °C)

**Assay Information:** 

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

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

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

#### **Certified Abundance:**

#### **IV's Certified Abundance**

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

#### 4.0 TRACEABILITY TO NIST

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

#### **4.1 Thermometer Calibration**

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

#### 4.2 Balance Calibration

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

#### 4.3 Glassware Calibration

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

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

N/A

#### 6.0 INTENDED USE

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

#### 7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

#### 7.1 Storage and Handling Recommendations

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

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

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

#### 11.1 Certification Issue Date

September 03, 2021

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

#### 11.2 Lot Expiration Date

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

#### 11.3 Period of Validity

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

#### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Michael Booth Director, Quality Control Michael 2 Both

#### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director

RD: 07/14/2022

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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

#### (A) SAMPLE DESCRIPTION

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

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

#### (B) BREAKAGE OR MISSING ITEMS

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

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

#### (C) ANALYSIS OF SAMPLES

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

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





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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

ICSA-0803, Inferferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this solution by ICP-MS.

ICSB-0803, Analytes, mixed with ICSA-0803, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-MS.

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

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

ICSA: M5873

	Table 1.		VALUES" FOI 303, AND ICSA				MS
Element	CRQL	Part A (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)	Part A +Part B (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)
Al	20.0	[100000]			[100000]		
Sb	2.0	(1.5)	-2.5	5.5	(22.0)	18.0	26.0
As	1.0	(0.1)	-1.9	2.1	19.0	16.2	21.9
Ba	10.0	(1.2)	-18.8	21.2	(22.0)	2.0	42.0
Be	1.0	(0)	-2.0	2.0	19.0	16.2	21.9
Cd	1.0	(0.7)	-1.3	2.7	20.0	17.0	23.0
Ca	500	[100000]			[100000]		
С		[200000]			[200000]		
CI		[1000000]			[1000000]		
Cr	2.0	(21.0)	17.0	25.0	40.0	34.0	46.0
Co	1.0	(1.0)	-1.0	3.0	20.0	17.0	23.0
Cu	2.0	(8.0)	4.0	12.0	(25.0)	21.0	29.0
Fe	200	[100000]			[100000]		
Pb	1.0	(4.0)	2.0	6.0	25.0	21.3	28.8
Mg	500	[100000]			[100000]		
Mn	1.0	(7.0)	5.0	9.0	27.0	23.0	31.1
Мо		[2000]			[2000]		
Ni	1.0	(6.0)	4.0	8.0	24.0	20.4	27.6
Р		[100000]			[100000]		
K	500	[100000]			[100000]		
Se	5.0	(0.3)	-9.7	10.3	(19.0)	9.0	29.0
Ag	1.0	(0)	-2.0	2.0	18.0	15.3	20.7
Na	500	[100000]			[100000]		
S		[100000]			[100000]		
TI	1.0	(0)	-2.0	2.0	21.0	17.9	24.2
Ti		[2000]			[2000]		
V	5.0	(0.5)	-9.5	10.5	(19.0)	9.0	29.0
Zn	5.0	(11.0)	1.0	21.0	(29.0)	19.0	39.0

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

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

RD: 07/14/2022

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

Instructions for QATS Reference Material: ICP-MS ICS

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

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

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

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

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

#### (A) SAMPLE DESCRIPTION

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

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

#### (B) BREAKAGE OR MISSING ITEMS

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

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

#### (C) ANALYSIS OF SAMPLES

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

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





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

Instructions for QATS Reference Material: ICP-MS ICS

ICSB: M5874

ICSA-0803, Inferferents: Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this solution by ICP-MS.

ICSB-0803, Analytes, mixed with ICSA-0803, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 1% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-MS.

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

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

ICSA: M5873

	Table 1.		VALUES" FOI 303, AND ICSA				MS
Element	CRQL	Part A (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)	Part A +Part B (µg/L)	Lower Limit (µg/L)	Upper Limit (µg/L)
Al	20.0	[100000]			[100000]		
Sb	2.0	(1.5)	-2.5	5.5	(22.0)	18.0	26.0
As	1.0	(0.1)	-1.9	2.1	19.0	16.2	21.9
Ba	10.0	(1.2)	-18.8	21.2	(22.0)	2.0	42.0
Be	1.0	(0)	-2.0	2.0	19.0	16.2	21.9
Cd	1.0	(0.7)	-1.3	2.7	20.0	17.0	23.0
Ca	500	[100000]			[100000]		
С		[200000]			[200000]		
CI		[1000000]			[1000000]		
Cr	2.0	(21.0)	17.0	25.0	40.0	34.0	46.0
Co	1.0	(1.0)	-1.0	3.0	20.0	17.0	23.0
Cu	2.0	(8.0)	4.0	12.0	(25.0)	21.0	29.0
Fe	200	[100000]			[100000]		
Pb	1.0	(4.0)	2.0	6.0	25.0	21.3	28.8
Mg	500	[100000]			[100000]		
Mn	1.0	(7.0)	5.0	9.0	27.0	23.0	31.1
Мо		[2000]			[2000]		
Ni	1.0	(6.0)	4.0	8.0	24.0	20.4	27.6
Р		[100000]			[100000]		
K	500	[100000]			[100000]		
Se	5.0	(0.3)	-9.7	10.3	(19.0)	9.0	29.0
Ag	1.0	(0)	-2.0	2.0	18.0	15.3	20.7
Na	500	[100000]			[100000]		
S		[100000]			[100000]		
TI	1.0	(0)	-2.0	2.0	21.0	17.9	24.2
Ti		[2000]			[2000]		
V	5.0	(0.5)	-9.5	10.5	(19.0)	9.0	29.0
Zn	5.0	(11.0)	1.0	21.0	(29.0)	19.0	39.0

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

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

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# Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: **Lot Number:** Description: 57051 120523 BTU9 1000 120526 Ambient (20 °C) Antimony (Sb) 3000.41 0.058 5E-05 Flask Uncertainty Balance Uncertainty 24002546 Lot # 2.0% M.5802 Nitric Acid Solvent: 0.00 MSBOS Nitric Acid Formulated By: Reviewed By: Pedro L. Rentas Lawrence Barry 120523 120523

1. Antimony (Sb)

58151

100923

0.1000

300.0

1000

10001.4

1000.0

7440-36-0

0.5 mg/m3

orl-rat 7000 mg/kg 3102a

Number Part

Number Ď

Vol. (ml.)

Pipette (ml.) Conc. (µg/ml.)

Conc. (µg/mL)

Conc. (µg/ml.)

+/- (µg/mt.) Uncertainty Expanded

CAS#

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

LD50

SRM NIST SDS Information

Final

Dilution Factor

Initial

Uncertainty

Nominal

Compound

-2/m	1.057	m/z-> 2.0E7	2. 6 8	5.0E5	2.0 E	6.OE6
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		200		100		

Part # 57051



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

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

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(1) = 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 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).

Printed: 1/16/2024, 3:48:48 PM

Part # 57051

Lot # 120523

Certified Reference Material CRM

M6030



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

R = 8 | 5 | 24

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CERTIFIED WEIGHT REPORT:

800-368-1131

Absolute Standards, Inc.

Part Number: Solvent: 24002546 Lot # Nitric Acid

Lot Number: Description: 57047 122823 Silver (Ag)

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

Weight shown below was diluted to (mL): 4000.30

Silver nitrate (Ag)

IN035 J0612AGA1

1000.0

0.10

63.7

6.27992

6.27998

1000.0

2.0

7761-88-B

10 ug/m3

Z

3151

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

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

Formulated By:

Benson Chan

122823

122823

Reviewed By: Pedro L. Rentas

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

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

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							race Me	letals	Verificat	tion	by ICP-I	S	ug/mL)						
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A	<0.02	Ω	<0.02	Dy	<0.02	出	<0.02	Ľ	<0.02	Z	<0.02	7	<0.02	Se	<0.2	4	40.02	W	<0.02
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Physical Characterization:

(T)= Target analyte

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

Certified by:

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

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

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# Certified Reference Material CRM

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

R: 03/16/23 MS473 MS474, MS475, MS Lot #

CERTIFIED WEIGHT REPORT:

Part Number:

56138 082922

Solvent: 20510011

Nitric Acid

2% 20.0 Nitric Acid

<u>P</u>

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB 10000 Recommended Storage:

Ambient (20 °C) 082925

**Expiration Date:** 

Description: Lot Number:

Strontium (Sr)

Weight shown below was diluted to (mL):

1000.12

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

RM#

Number

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/mL) +/- (µg/mL)

Uncertainty

Expanded

닭

Nominal

Purity Uncertainty Assay

Formulated By: Lawrence Barry

Pedro L. Rentas

Reviewed By:

082922

082922

SDS Information (Solvent Safety Info. On Attached pg.)

OSHA PEL (TWA)

SRM SRM

CAS#

LD50

Ι₹ orl-rat >2000mg/kg 3153a

Strontium nitrate (Sr m/z-> M/z-> 2.5E6 5.0E6 5.0E5 1.0E6 2.5 € 6 5.0E6 [1] Spectrum No.1 110 10 IN017 SRZ022018A1 120 20 [ 14.495 sec]:58138.D# [Count] [Linear] 10000 130 30 99.997 140 0.10 40 41.2 150 50 24.2756 24.2758 160 60 10000.1 170 0 20.0 80 10042-76-9 190 90 200 100

m/z->

210

220

230

240

250

260

1 of 2

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

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As	<0.2	င္စ	<0.02	땹	<0.02	F	<0.02	Mg	<0.01	ွ	<0.02	R.	<b>△</b> 0.02	Ag	<0.02	∄	<0.02	<	<0.02
Ba	<0.02	ဂ္ဂ	<0.02	ନ୍ଦ	<0.02	ī	<0.02	M	<0.02	Pd	<b>△</b> 0.02	RЪ	<0.02	N <sub>2</sub>	<0.2	∄	<0.02	4,4	<0.02
Be	<0.01	τ	40.02	ନ୍ଥ	<0.02	뜐	<0.2	Нg	<0.2	Ъ	<0.02	Ru	<0.02	S.	Т	Tm	<0.02	~	<0.02
Bi	0.02	င္ပ	<0.02	ဌာ	<0.02	La	<0.02	Μo	<0.02	뫈	<0.02	Sm	<0.02	S	<b>△</b> 0.02	S	<0.02	Zn	<0.02
В	<0.02	5	<0.02	Au	<0.02	Рь	<0.02	Nd	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	Ħ	<0.02	Zr	<0.02

Physical Characterization:

(T)= Target analyte

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

Certified by:

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

  \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
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- Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- \* All Standards should be stored with caps tight and under appropriate laboratory conditions.

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

Part # 56138

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# Certified Reference Material CRM

M6023

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

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

RW#

Number

Conc. (µg/mL) (%)

Purity (%) (%)

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

CAS#

OSHA PEL (TWA)

LD50

SRM

~-Z/III	5.0E5	1.0E6	m/z->	5000	1.0€4	1.0E6	2.OE6	
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Part # 57081



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

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

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## Physical Characterization:

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

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

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

\* All standard containers are meticulously cleaned prior to use.

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

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

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

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

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

www.absolutestandards.com



# Certified Reference Material CRM

M6021

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

CERTIFIED WEIGHT REPORT Part Number: Lot Number: 57023 062424 24002546 Nitric Acid Solvent:

Nitric Acid

Ambient (20 °C) 2.0% (mL) 40.0

Formulated By:

Aleah O'Brady

062424

ASSET O DE LONG

Recommended Storage:

**Expiration Date:** 

062427

Description:

Vanadium (V)

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): NIST Test Number: **6UTB** 1000 2000.3 5E-05 0.06 Balance Uncertainty Flask Uncertainty Reviewed By:

Pedro L. Rentas

062424

Ammonium metavanadate (V) Compound 58123 Number Part 021224 Number D D 0.1000 Dilution Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) 200.0 Initial Uncertainty 0.084 Nominal 1000 Conc. (µg/mL) Conc. (µg/mL) 10000.3 nitial 1000.0 Final +/- (µg/mL) Uncertainty Expanded 22 7803-55-6 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) 0.05 mg/m3 **SDS Information** orl-rat 58.1mg/kg LD50 3165 NIST SRM

7/2-7	P. 58 E. 6	m/z->- 5,0E8	1.0E7	m/z-> 2.0E7	1.0厘6	2.0E6
210		110		0		
220		1 20		N.		
Ö		Ö		0		
N G O		130		30		
N:				<b>A</b>		
N 4		140		0		
N 50		50		50		
b:						ı
260		160		60		
		170		70		
		<b>d</b> .		80		
		190		90		
		200		100		

Part # 57023

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

	E	В	Ве	Ba	AS	00	2 2	Δ		
(T) = Target analyte	40,02	A),02	40.01	40.02	40.2	20.02	200	A		
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	Au	ဂ္ဂ	స్ట	හු	Ē	乓	Ş			
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	3	<u>.</u>	737	5	급	Но	H	1		
	40.02	40.02	40,2	0.02	₫.02	40.02	40.02		Irace M	
	곱	Mo	He	Mn	Mg	댭	Σ		Metals	
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	A0,2	A 20.02	A).02	A).02	₫.02	<0.02	0.02	DESIGNATIONS OF	oy ICP-N	
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	ng (	so s	?	Z,	Ag	Si	æ			l
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	6.65 6.65 6.65 6.65 6.65 6.65 6.65 6.65	2 6	3 6	§ .	-3	A 0.02	<0.02	THE REAL PROPERTY.		

## Physical Characterization:

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

Certified by:

- \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- \* All standard containers are meticulously cleaned prior to use.
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- \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
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