

## **Prep Standard - Chemical Standard Summary**

Order ID: O2505

Test: Metals Group3

Prepbatch ID: PB152536,

Sequence ID/Qc Batch ID: LB125255,LB125255,

#### Standard ID:

MP74703,MP75083,MP75136,MP75137,MP75138,MP75139,MP75140,MP75141,MP75142,MP75143,MP75144,MP75145,MP75147,MP75148,MP75149,MP75150,MP75151,MP75152,

#### Chemical ID:

M4589, M4657, M4768, M4825, M4874, M4876, M4877, M4879, M4880, M4881, M4882, M4883, M4884, M4885, M4886, M4888, M4889, M4891, M4894, M4901, M4939, M4960, M4961, M5019, M5020, M5100, M5108, M5128, M5184, M5192, M5193, M5200, M5201, M5218, M5221, M5224, M5226, M5227, M5286, M5289, M5292, M5318, M5323, M5387, M5393, M5422, M5429, M5468, M5469, M5469, M5483, M5513, M5521, M5527, M5533, M5539, W2606,

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## **Metals STANDARD PREPARATION LOG**

Recipe ID 169	<b>NAME</b> 1:1HNO3	NO. MP74703	Prep Date 04/05/2023		Prepared By Al-Terek Isaac	<u>ScaleID</u> None	PipetteID None	Supervised By Bin He 04/05/2023
FROM	1250.00000ml of M5483 + 1250.0000	00ml of W26	606 = Final Q	uantity: 2500.0	00 ml			

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
902	ICP AES CAL BLK ( SO/ICB/CCB)	MP75083	04/27/2023	05/03/2023	Bin He	None	METALS_PIP	
							ETTE_3 (A)	04/28/2023

FROM 125.00000ml of M5452 + 2350.00000ml of W2606 + 25.00000ml of M5527 = Final Quantity: 2500.000 ml

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## **Metals STANDARD PREPARATION LOG**

Recipe ID 902	NAME ICP AES CAL BLK ( SO/ICB/CCB)	NO. MP75136	Prep Date 05/01/2023		Prepared By Bin He	ScaleID None	<u>PipetteID</u> METALS PIP	Supervised By Sarabjit Jaswal
002	TOT THE OTHER ETT ( OOTHOR TOOK)	<u> </u>	00/01/2020	00/11/2020	Biii i i i	110110	ETTE_3 (A)	05/02/2023
FROM	125.00000ml of M5533 + 2350.00000	Oml of W260	06 + 25.00000	oml of M5527 =	Final Quantity:	2500.000 ml		

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabiit Jaswal
903	ICP AES RINSE SOLN	MP75137	05/01/2023	05/14/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

**FROM** 200.0000ml of M5539 + 9800.0000ml of W2606 = Final Quantity: 10000.000 ml

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## **Metals STANDARD PREPARATION LOG**

Recipe ID 904	NAME ICP AES ICSA SOLN	NO. MP75138	Prep Date 05/01/2023	Expiration Date 05/14/2023	Prepared By Bin He	<u>ScaleID</u> None	PipetteID  METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 05/02/2023
FROM	10.00000ml of M5128 + 90.00000ml	of MP75136	6 = Final Qua	ntity: 100.000	ml			

	<u>Recipe</u>				Expiration	Prepared			Supervised By
	<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
	3494	ICP AES ICSAB SOLN-1	MP75139	05/01/2023	05/14/2023	Bin He	None	METALS_PIP ETTE_3 (A)	
ŀ								l	

FROM 0.10000ml of M4589 + 0.10000ml of M4880 + 0.10000ml of M4882 + 0.10000ml of M4939 + 0.10000ml of M5469 + 10.00000ml of M5128 + 10.00000ml of M5221 + 79.50000ml of MP75136 = Final Quantity: 100.000 ml

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## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID PipetteID	Supervised By	
907	ICP AES STD S ( S5 )	MP75140	05/01/2023	05/14/2023	Bin He	None	METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 05/02/2023	
FROM	FROM 5.00000ml of M4589 + 5.00000ml of M4880 + 5.00000ml of M4882 + 5.00000ml of M4939 + 5.00000ml of M5100 + 5.00000ml								

of M5224 + 5.00000ml of M5393 + 5.00000ml of M5469 + 460.00000ml of MP75136 = Final Quantity: 500.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By
910	<del></del>		05/01/2023	05/14/2023	Bin He		METALS PIP	Sarabjit Jaswal
							ETTE_3 (A)	05/02/2023

100.00000ml of MP75136 + 100.00000ml of MP75140 = Final Quantity: 200.000 ml **FROM** 

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## **Metals STANDARD PREPARATION LOG**

Recipe	NAME	NO	Bron Doto	Expiration	<u>Prepared</u>	SaalalD	DinettelD	Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date		<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
909	ICP AES STD S3	MP75142	05/01/2023	05/14/2023	Bin He	None	METALS_PIP ETTE_3 (A)	05/02/2023
								03/02/2023
FROM	150.00000ml of MP75136 + 50.0000	0ml of MP7	5140 = Final	Quantity: 200.0	00 ml			

 cipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u> 913	NAME ICP AES STD S2	NO. MP75143	Prep Date 05/01/2023	<u>Date</u> 05/14/2023	<u><b>By</b></u> Bin He	<u>ScaleID</u> None	PipetteID  METALS PIP	Sarabjit Jaswal
							ETTE_3 (A)	05/02/2023

FROM 16.00000ml of MP75140 + 184.00000ml of MP75136 = Final Quantity: 200.000 ml

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## **Metals STANDARD PREPARATION LOG**

<b>Recipe ID</b> 911	NAME ICP AES CCV SOLN	NO. MP75144	Prep Date 05/01/2023	Expiration Date 05/14/2023	Prepared By Bin He	<u>ScaleID</u> None	PipettelD  METALS_PIP ETTE_3 (A)	
FROM	100.00000ml of MP75136 + 100.000	00ml of MP	75140 = Fina	l Quantity: 200.	000 ml			

Recipe				<b>Expiration</b>	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
902	ICP AES CAL BLK ( SO/ICB/CCB)	MP75145	05/01/2023	08/31/2023	Bin He	None	METALS_PIP ETTE 3 (A)	
							L11L_3 (A)	05/02/2023

FROM 125.00000ml of M5452 + 2350.00000ml of W2606 + 25.00000ml of M5527 = Final Quantity: 2500.000 ml

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#### Metals STANDARD PREPARATION LOG

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabiit Jaswal
2950	ICP AES S1/CRI STOCK STD	MP75147	05/01/2023	06/30/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

**FROM** 

 $0.03000ml\ of\ M4876+0.03000ml\ of\ M4877+0.05000ml\ of\ M4657+0.05000ml\ of\ M4885+0.05000ml\ of\ M4894+0.05000ml\ of\ M5289+0.06000ml\ of\ M4881+0.10000ml\ of\ M4874+0.10000ml\ of\ M4880+0.10000ml\ of\ M4883+0.10000ml\ of\ M4893+0.10000ml\ of\ M5184+0.10000ml\ of\ M5226+0.10000ml\ of\ M5469+0.15000ml\ of\ M4825+0.20000ml\ of\ M4768+0.20000ml\ of\ M4886+0.20000ml\ of\ M4888+0.20000ml\ of\ M4889+0.20000ml\ of\ M4891+0.20000ml\ of\ M5227+0.25000ml\ of\ M5224+0.50000ml\ of\ M4901+0.50000ml\ of\ M5387+1.00000ml\ of\ M4879+1.00000ml\ of\ M5108+1.00000ml\ of\ M5192+1.00000ml\ of\ M5201+1.00000ml\ of\ M5468+2.00000ml\ of\ M4882+2.00000ml\ of\ M4884+87.38000ml\ of\ MP75145\ =\ Final\ Quantity: 100.000\ ml$ 

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By
2951	ICP AES S1/CRI WORK STD		05/01/2023	05/14/2023	Bin He	None	METALS_PIP ETTE_3 (A)	

FROM 196.00000ml of MP75145 + 4.00000ml of MP75147 = Final Quantity: 200.000 ml

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## Metals STANDARD PREPARATION LOG

Recip ID 3651	NAME LR CHECK 1	NO. MP75149	Prep Date 05/01/2023	Expiration Date 05/14/2023	Prepared By Bin He	ScaleID None	PipettelD  METALS_PIP ETTE_3 (A)		
FRO	FROM 10.00000ml of M5201 + 18.00000ml of M5193 + 18.00000ml of M5200 + 18.00000ml of M5468 + 20.00000ml of M5289 + 9.00000ml of M4894 + 7.00000ml of MP75136 = Final Quantity: 100.000 ml								

Recipe				<b>Expiration</b>	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
3652	LR CHECK2	MP75150	05/01/2023	05/14/2023	Bin He	None	METALS_PIP	•
							ETTE_3 (A)	05/02/2023

FROM 10.00000ml of M5387 + 2.50000ml of M5513 + 25.0000ml of M5521 + 3.50000ml of M4891 + 4.50000ml of M5184 + 5.0000ml of M4768 + 54.50000ml of MP75136 = Final Quantity: 100.000 ml

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## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME.	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
912	ICP AES ICV SOLN	MP75151	05/01/2023	05/14/2023	Bin He	None	METALS_PIP ETTE_3 (A)	05/02/2023

FROM 0.02500ml of M5019 + 0.02500ml of M5020 + 0.02500ml of M5429 + 0.25000ml of M5218 + 0.25000ml of M5469 + 10.00000ml of M5292 + 89.42500ml of MP75136 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
919	ICP AES INTERNAL STD	MP75152	05/01/2023	06/30/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

FROM 1.00000ml of M4961 + 10.00000ml of M4960 + 1969.00000ml of W2606 + 20.00000ml of M5527 = Final Quantity: 2000.000 ml



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	R2-MEB694243	06/29/2024	07/13/2020 / bin	07/02/2020 / bin	M4589
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	082620	08/26/2023	11/11/2020 / bin	10/28/2020 / bin	M4657
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Nickel (Ni) 1000PPM	072420	07/24/2023	02/26/2021 / BIN	10/28/2020 / BIN	M4768
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	020821	02/08/2024	05/23/2021 / jaswal	05/18/2021 / jaswal	M4825
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	/ Arsenic (As)	012521	01/25/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4874
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	030221	03/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4876



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	072821	07/28/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4877
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	061421	06/14/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4879
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57015 / P, 1000 PPM, 125 ml	051121	05/11/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4880
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57082 / Pb, 1000 PPM, 125 ml	062221	06/22/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4881
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	051721	05/17/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4882
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	070221	07/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4883



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	030921	03/09/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4884
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	072921	07/29/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4885
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	021121	02/11/2024	08/05/2021 / jaswal	08/05/2021 / jaswal	M4886
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57022 / Ti, 1000 PPM, 125 ml	070721	07/07/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4888
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute	57081 / TI, 1000 PPM, 125	073021	07/30/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4889
Standards, Inc.				ĺ	ĺ	
Standards, Inc.  Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	061021	06/10/2024	07/26/2021 / bin	06/25/2021 / jaswal	M4894
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	031921	03/19/2024	08/06/2021 / jaswal	08/06/2021 / jaswal	M4901
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	030221	03/02/2024	09/23/2021 / bin	09/22/2021 / bin	M4939
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	100721	10/07/2024	10/09/2021 / jaswal	10/08/2021 / jaswal	M4960
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58139 / Y, 10000 PPM, 500 ml	052521	05/25/2024	10/09/2021 / jaswal	01/25/2019 / jaswal	M4961
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	011421	01/14/2024	12/13/2021 / bin	12/09/2021 / bin	M5019



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	032921	03/29/2024	12/13/2021 / bin	12/09/2021 / bin	M5020
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL	R2-MEB689870	02/14/2024	03/14/2022 / bin	04/29/2020 / bin	M5100
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	082021	08/20/2024	12/05/2021 / bin	10/05/2021 / bin	M5108
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	10/27/2023	04/27/2023 /	04/20/2021 / bin	M5128
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	060122	06/01/2025	07/01/2022 / bin	06/02/2022 / jaswal	M5184
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.	58120 / Ca, 10000 PPM, 500 ml	082021	08/20/2024	06/23/2022 / bin	09/25/2021 / bin	M5193
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	092121	09/21/2024	06/23/2022 / bin	10/05/2021 / bin	M5200
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	062321	06/23/2024	06/23/2022 / bin	10/05/2021 / bin	M5201
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	S2-MEB711674	07/01/2024	07/01/2022 / bin	09/10/2021 / bin	M5218
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	ICSB-0710	10/27/2023	04/27/2023 /	04/20/2021 / bin	M5221
	` '	ICSB-0710			04/20/2021 /	M5221  Chemtech Lot #



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	022822	02/28/2025	06/15/2022 / bin	03/30/2022 / bin	M5226
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	100121	10/01/2024	07/01/2022 / bin	10/18/2021 / bin	M5227
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	08/30/2024	/	09/07/2022 / bin	M5286
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Aluminum (Al) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	09/20/2023	03/20/2023 / bin	02/20/2020 / bin	M5292
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Inorganic Ventures	WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml	S2-MEB710999	10/18/2025	03/29/2023 / bin	08/11/2022 / bin	M5318



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml	R2-MEB693161	05/20/2024	03/29/2023 / bin	08/11/2022 / bin	M5323
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	072122	07/21/2025	11/01/2022 / jaswal	09/18/2022 / jaswal	M5387
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB714159	12/12/2023	10/12/2022 / bin	09/19/2022 / bin	M5393
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
PCI Scientific Supply, Inc.	26397-103 / PTFE BOILING STONES	26397-103g	07/09/2023	01/09/2023 / Al-Terek	01/09/2023 / Al-Terek	M5422
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57103 / Li, 10000 PPM, 125 ml	070622	07/06/2025	01/30/2023 / bin	01/26/2023 / bin	M5429
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22D1462006	09/07/2023	03/26/2023 / Al-Terek	02/24/2022 / Al-Terek	M5452



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	120922	12/09/2025	03/14/2023 / jaswal	03/14/2023 / jaswal	M5468
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	082922	08/29/2025	03/16/2023 / jaswal	03/16/2023 / jaswal	M5469
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)	22B0862001	10/05/2023	04/05/2023 / Al-Terek	01/28/2022 / Al-Terek	M5483
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	061522	06/15/2025	03/19/2023 / bin	03/17/2023 / bin	M5513
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	102622	10/26/2025	11/21/2022 / bin	11/20/2022 / bin	M5521
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)	23B0262006	10/17/2023	04/25/2023 / jaswal	01/13/2023 / Al-Terek	M5527



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)	22E1662006	11/01/2023	05/01/2023 / Al-Terek	04/11/2022 / Al-Terek	M5533

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)	23B0262006	11/02/2023	05/02/2023 / Al-Terek	01/13/2023 / Al-Terek	M5539

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



## CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030 fax: 540.585.3012 info@inorganicventures.com

Christiansburg, VA 24073 · USA inorganicventures.com

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

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



#### PRODUCT DESCRIPTION 2.0

Multi Analyte Custom Grade Solution Product Code:

CLPP-CAL-1 Catalog Number: R2-MEB689870 Lot Number: Matrix: 5% (v/v) HNO3 Value / Analyte(s):

5 000 μg/mL ea:

Calcium, Potassium, Magnesium, Sodium,

2 000 µg/mL ea:

Aluminum, Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese,

250 μg/mL ea:

Copper, Silver,

200 μg/mL ea: Chromium, 50 µg/mL ea: Beryllium

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

ANALYTE Aluminum, Al	CERTIFIED VALUE 2 000 ± 7 μg/mL	ANALYTE Barium, Ba	CERTIFIED VALUE 2 000 ± 9 μg/mL
Beryllium, Be	50.00 ± 0.24 μg/mL	Calcium, Ca	5 000 ± 20 μg/mL
Chromium, Cr	200.0 ± 1.2 μg/mL	Cobalt, Co	500.0 ± 2.4 μg/mL
Copper, Cu	250.0 ± 1.0 μg/mL	Iron, Fe	1 000 ± 4 μg/mL
Magnesium, Mg	5 000 ± 20 μg/mL	Manganese, Mn	500.0 ± 1.9 μg/mL
Nickel, Ni	500.0 ± 2.2 μg/mL	Potassium, K	5 000 ± 18 μg/mL
Silver, Ag	250.0 ± 1.1 μg/mL	Sodium, Na	5 000 ± 18 μg/mL
Vanadium, V	500.0 ± 2.2 μg/mL	Zinc, Zn	500.0 ± 2.1 μg/mL

**Density:** 1.116 g/mL (measured at  $20 \pm 4$  °C)

## **Assay Information:**

3	say iiiioiiiiatioii.			
	ANALYTE	METHOD	NIST SRM#	SRM LOT#
	Ag	ICP Assay	3151	160729
	Ag	Volhard	999c	999c
	Al	ICP Assay	3101a	140903
	Al	EDTA	928	928
	Ва	ICP Assay	3104a	140909
	Ва	Gravimetric		See Sec. 4.2
	Ве	ICP Assay	3105a	090514
	Ве	Calculated		See Sec. 4.2
	Ca	ICP Assay	3109a	130213
	Ca	EDTA	928	928
	Co	EDTA	928	928
	Co	ICP Assay	traceable to 3113	M2-CO661665
	Cr	ICP Assay	3112a	170630
	Cr	Calculated		See Sec. 4.2
	Cu	ICP Assay	3114	121207
	Cu	EDTA	928	928
	Fe	ICP Assay	3126a	140812
	Fe	EDTA	928	928
	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
	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 (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ 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 u<sub>bb</sub> = 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 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; inorganic ventures.com; info@inorganic ventures.com

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

#### 11.1 Certification Issue Date

February 14, 2020

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

#### 11.2 Lot Expiration Date

- February 14, 2024
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

#### 11.3 Period of Validity

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

Michael 2 Booth

#### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

#### **Certificate Approved By:**

Michael Booth Manager, Quality Control

#### **Certifying Officer:**

Paul Gaines

CEO, Senior Technical Director

Paul R & ine



# 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

CLPP-CAL-3 Catalog Number: T2-MEB714159 Lot Number: Matrix: 7% (v/v) HNO3 Value / Analyte(s):

> Arsenic, Lead, Selenium, Thallium,

500 µg/mL ea: Cadmium

1 000 µg/mL ea:

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

**ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE** 1 000 ± 8 µg/mL Cadmium, Cd  $500.0 \pm 2.1 \,\mu g/mL$ Arsenic, As Lead, Pb 1 000 ± 5 µg/mL Selenium, Se 1 000 ± 8 µg/mL

Thallium, TI 1 000 ± 7 µg/mL

Density: 1.043 g/mL (measured at 20  $\pm$  4 °C)

#### **Assay Information:**

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

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

#### Characterization of CRM/RM by Two or More Methods 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 (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ 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 u<sub>bb</sub> = 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 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; inorganic ventures.com; info@inorganic ventures.com

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

#### 11.1 Certification Issue Date

January 13, 2022

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

#### 11.2 Lot Expiration Date

- January 13, 2027
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

#### 11.3 Period of Validity

<ul> <li>Sealed TCT Bag C</li> </ul>	pen Date:

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

#### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

#### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

#### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

20178Ci



## CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030 fax: 540.585.3012 info@inorganicventures.com

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

#### 1.0 ACCREDITATION / REGISTRATION

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



#### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

 Catalog Number:
 CHEM-CLP-4

 Lot Number:
 R2-MEB694243

 Matrix:
 3% (v/v) HNO3

 3% (v/v) HF

Value / Analyte(s): 1 000 µg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

#### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Boron, B  $1\ 000\ \pm\ 7\ \mu g/mL$  Molybdenum, Mo  $1\ 000\ \pm\ 5\ \mu g/mL$  Silicon, Si  $1\ 000\ \pm\ 7\ \mu g/mL$  Tin, Sn  $1\ 000\ \pm\ 5\ \mu g/mL$ 

Titanium, Ti 1 000  $\pm$  7  $\mu$ g/mL

**Density:** 1.031 g/mL (measured at 20  $\pm$  4 °C)

#### Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
В	ICP Assay	3107	110830
Mo	ICP Assay	3134	130418
Si	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

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

#### Characterization of CRM/RM by Two or More Methods 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 (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ 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 u<sub>bb</sub> = 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 SRMRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMRM 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 CRWRMs.

#### 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 CRMRM is negligible. After opening the sealed TCT bag transpiration of the CRMRM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

#### 8.0 HAZARDOUS INFORMATION

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

#### 9.0 HOMOGENEITY

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

#### 10.0 QUALITY STANDARD DOCUMENTATION

#### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

#### 11.1 Certification Issue Date

June 29, 2020

- 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, contaminated, or otherwise modified.

#### 11.2 Lot Expiration Date

- June 29, 2024
- 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

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

- 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.

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 Sains

## Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



#### Certified Reference Material CRM

19410105

Nitric Acid

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>58024</u>
Lot Number: 082620

Description: Chromium (Cr)

2.0% 40.0 082623 (mL)

Uncertainty

Initial

Recommended Storage: Ambient (20 °C)

Part

Nominal Concentration (µg/mL): 1000

**Expiration Date:** 

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Lot

Formulated By: Lawrence Barry 082620

Lawrence Barry 082620

Reviewed By: Pedro L. Rentas 082620

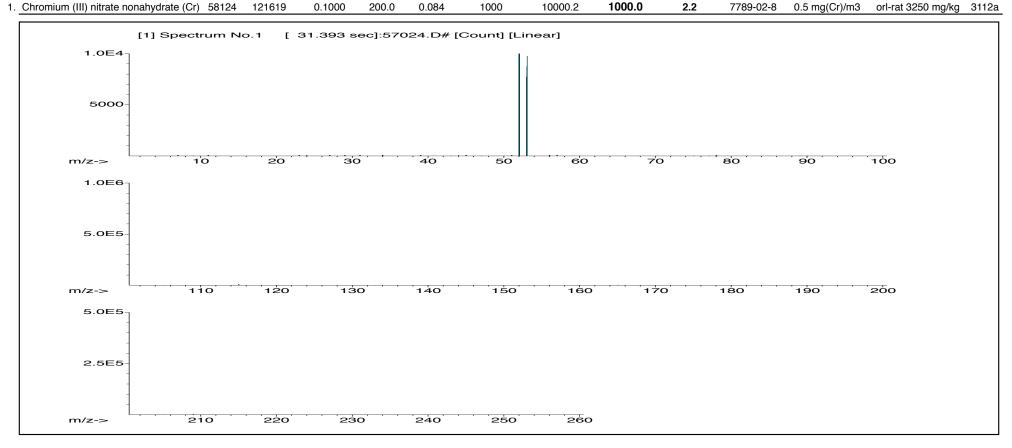
**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound

Number Number Factor Vol. (mL) Pipette Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 SRM

Nominal



#### 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 Metals Verification by ICP-MS (µg/mL)																		
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb I	<0.02	l w	<0.02
Sb	<0.02	Ca	<0.02	Er	< 0.02	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	< 0.02	U "	<0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	T	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

#### Physical Characterization:

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

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

Certified by:

Bu f. All

800-368-1131 www.absolutestandards.com



R: |0/28/2020 GB Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: 1. Nickel (II) nitrate Hexahydrate (Ni) Nominal Concentration (µg/mL): m/z-> m/z-> m/z-> 5.0E6 1.0E7 1.0E5 2.0E5 Recommended Storage: 2500 5000 Volume shown below was diluted to (mL): NIST Test Number: **Expiration Date:** Part Number: Description: Lot Number: [1] Spectrum No.1 210 110 10 58128 Number Part 23060 57028 072420 1000 Ambient (20 °C) 072423 082719 Nickel (Ni) 220 120 Lot 20 9.135 sec]:58028.D# [Count] [Linear] 2000.02 0.1000 Dilution Factor 230 130 30 Vol. (mL) Pipette (mL) 200.0 0.058 5E-05 Flask Uncertainty Balance Uncertainty Uncertainty 140 0.013 40 Conc. (µg/mL) 19410105 Nominal 2.0% Lot # 1000 250 150 50 Conc. (µg/mL) Nitric Acid 10000.5 Solvent: Initial (mL) 40.0 260 160 Conc. (µg/mL) Nitric Acid 1000.0 Final 170 0 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Expanded 2.0 Lamone 180 80 13478-00-7 (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) Pedro L. Rentas 190 Lawrence Barry 90 SDS Information 1 mg/m3 200 100 orl-rat 1620 mg/kg 072420 072420 3136 TSIN SRM

www.absolutestandards.com



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

	B	В	Be Be	Ба	3	· 6	9 3	Δ			
	<0.02	<0.02	<0.01	<0.02	2.02	20.02	20.02	20.00			
	Cu	60	5	S	, e	3	3 5	62			
	<0.02	<0.02	<0.02	<0.02	<0.02	20.2	20.02	20.02			
-	Au	Ge	Ga	Gd	Eu	1 4	ָר דָּ				
The state of the s	<0.02	< 0.02	<0.02	<0.02	<0.02	<0.02	<0.02				
	РЬ	La	Fe	lr	In	Но	: =				
	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02		-	Irace V	
	Z	Mo	Hg	Mn	Mo	Lu	΄ Σ			etals	
20,02	<0.00	< 0.02	<0.2	< 0.02	<0.01	<0.02	<0.02			Verifica	
,,	~	72	P	Pd	Os	N	Z			tion	1000
40.4	200	< 0.02	< 0.02	< 0.02	< 0.02	<0.02	Н		3	by ICP-N	
υC	ç	Sm	Ru	Rb	Rh	Re	Pr		5		
V0.02	3	< 0.02	< 0.02	< 0.02	< 0.02	<0.02	<0.02	State of the latest of the lat	9,,		
La	7	S	Sr	Na	Ag	Si	Se				
<0.02	20.00	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2				
=	H :	Sn	Tm	Th	Ħ	Te	Ть				
<0.02	0.02	<000	<0.02	<0.02	<0.02	<0.02	<0.02	No. of the Control of			
17	1 [	7 <sub>n</sub>	Υ	Yb	<	U	W	STATE			Comment of the last
<0.02	70.02	2002	<0.02	<0.02	<0.02	<0.02	<0.02			. 1	

(T)= Target analyte

# **Physical Characterization:**

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

Certified by:

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

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

## **Absolute Standards, Inc.**

800-368-1131 www.absolutestandards.com



#### Certified Reference Material CRM

19410105

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>57027</u>
Lot Number: 020821

Description: Cobalt (Co)

Part

Expiration Date: 020824

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

Volume shown below was diluted to (mL): 1999.78 0.265 Flask Uncertainty

Lot

Formulated By: Lawrence Barry 020821

Serviewed By: Pedro L. Rentas 020821

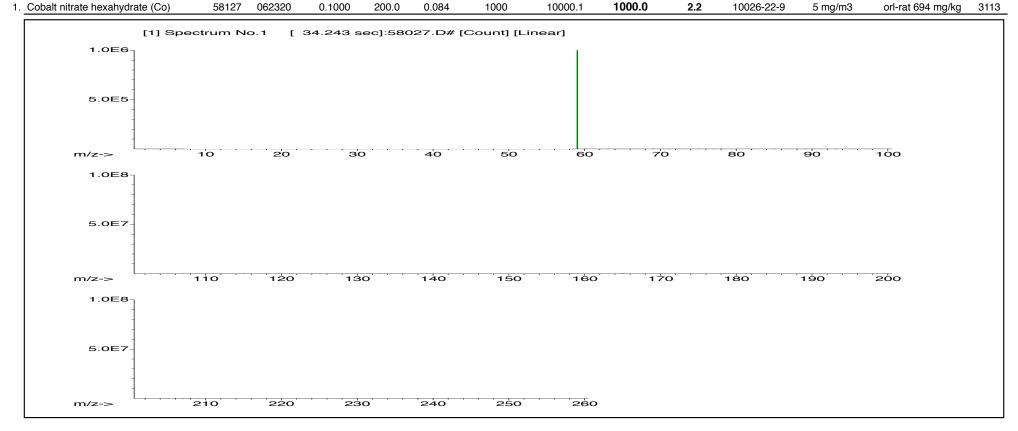
**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound

Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50 SRM

Nominal



#### 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 Metals Verification by ICP-MS (μg/mL)																		
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	< 0.02	Fe	<0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	T	Ge	< 0.02	La	< 0.02	Мо	< 0.02	Pt	< 0.02	Sm	<0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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

Bu P. Sha

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

19410105

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57033

 Lot Number:
 012521

Description: Arsenic (As)

**Expiration Date:** 012524

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

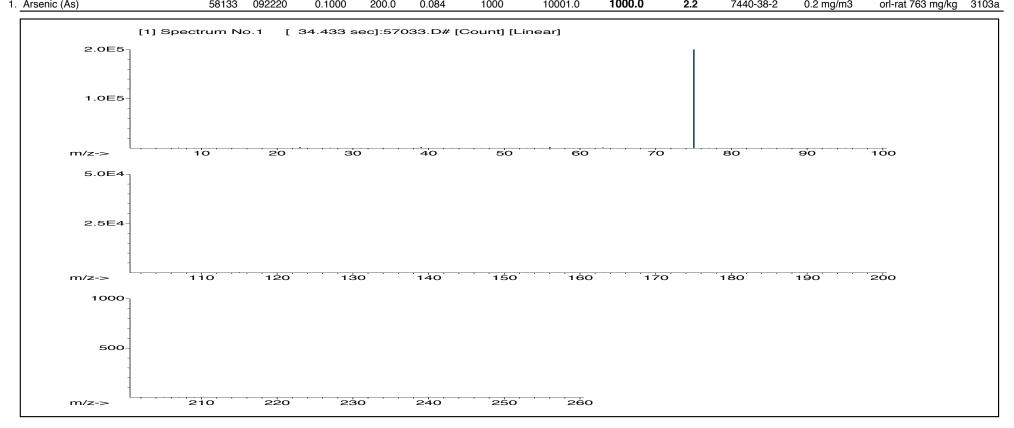
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By: Lawrence Barry 012521

Adds Reviewed By: Pedro L. Rentas 012521

**SDS Information** 

	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	ent Safety Info. On A	Attached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1 Arconio (Ac)	50122	വരാദാവ	0.1000	200.0	0.004	1000	10001 0	1000 0	2 2	7440 20 2	$0.2  \text{ma/m}^2$	orl rat 762 ma/ka	21022





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

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	T	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

### Physical Characterization:

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

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

Certified by:

Bur P. Sha

Part # 57033 Lot # 012521 2 of 2 Printed: 2/8/2021, 11:15:08 PM

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### Certified Reference Material CRM

19410105

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>57004</u>

Lot Number: 030221

Description: Beryllium (Be)

Part

Expiration Date: 030224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Lot

Formulated By: Lawrence Barry 030221

Lawrence Barry 030221

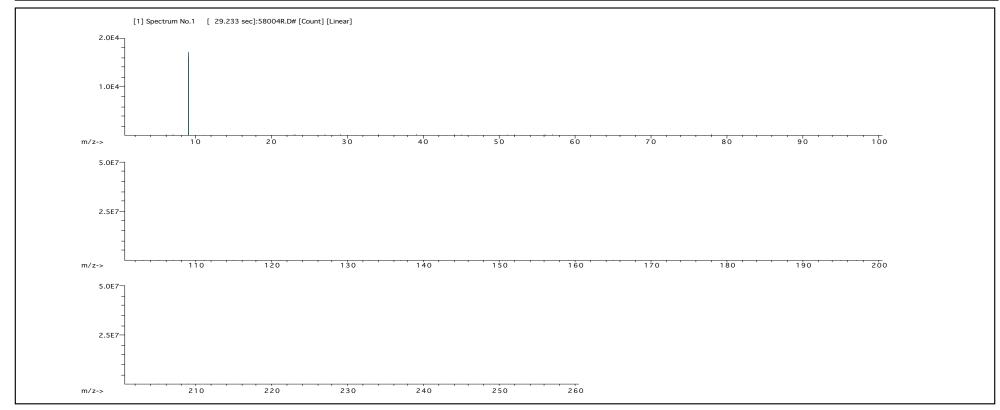
Reviewed By: Pedro L. Rentas 030221

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound	Number	Number	Factor	Vol. (mL)	Pipette	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
Beryllium acetate basic (Be)	58104	063020	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	19049-40-2	0.002 mg/m3	orl-rat 28 mg/kg	3105a

Nominal





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

Bu P. Sha

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	<0.02	Dy	< 0.02	Hf	< 0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	< 0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	T	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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

Part # 57004 Lot # 030221 2 of 2 Printed: 3/3/2021, 11:15:33 PM

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### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

20370011

2.0%



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

NIST

**CERTIFIED WEIGHT REPORT:** Lot # Solvent:

> Part Number: 57048 072821 Lot Number:

**Description:** Cadmium (Cd)

Part

**Expiration Date:** 072824

**Recommended Storage:** Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

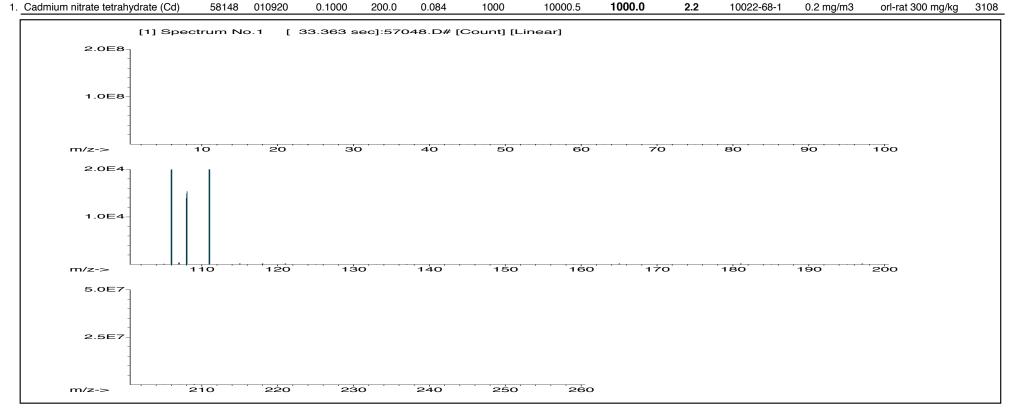
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Liovanni Esposito Formulated By: Giovanni Esposito 072821 Reviewed By 072821 Pedro L. Rentas

**SDS Information** 

Dilution Initial Uncertainty (Solvent Safety Info. On Attached pg.) Lot Uncertainty Compound SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS# OSHA PEL (TWA) LD50

Nominal





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

Bu P. All

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	T	Dy	<0.02	Hf	< 0.02	Li	< 0.02	Ni	<0.02	Pr	< 0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	< 0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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.

Part # **57048** Lot # **072821** Printed: 8/19/2021, 11:15:05 PM

<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.

<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.

<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



Expanded

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CERTIFIED WEIGHT REPORT: Lot #

Part Number: 58111 Solvent: 20370011 Nitric Acid

Lot Number: <u>061421</u>
Description: Sodium (Na)

2% 40.0 Nitric Acid **Expiration Date:** 061424 (mL)

Recommended Storage: Ambient (20 °C)

Nominal Concentration ( $\mu$ g/mL): 10000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

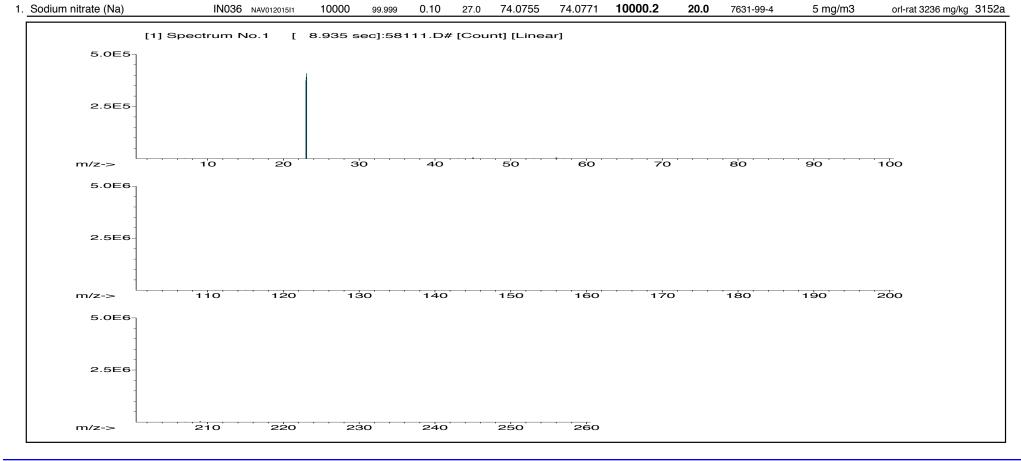
Weight shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By: Gabriel Helland 061421

Service Reviewed By: Pedro L. Rentas 061421

**SDS Information** 

		Lot	Nominal	Purity	Uncertainty	Assay	Target	Actual	Actual	Uncertainty	(Sol	vent Safety Info. On Atta	ched pg.)	NIST
Compound	RM#	Number	Conc. (µg/mL)	(%)	Purity (%)	(%)	Weight (g)	Weight (g)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM





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

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

							Trace Mo	etals	Verifica	tion	by ICP-M	S (µ	ıg/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	T1	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	T	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	<0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

### **Physical Characterization:**

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

Certified by:

Bu f. She

- \* 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

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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NIST

<u>CERTIFIED WEIGHT REPORT:</u>

Lot # Solvent:

Part Number: <u>57015</u> Lot Number: 051121

Description: Phosphorous (P)

Expiration Date: 051124

Part

Recommended Storage: Ambient (20 °C)

Nominal Concentration (μg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Lot

Formulated By: Lawrence Barry 051121

Lawrence Barry 051121

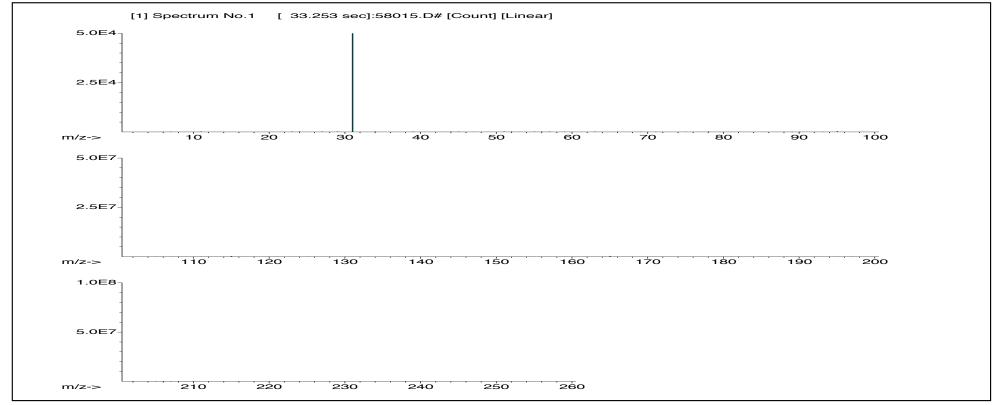
Reviewed By: Pedro L. Rentas 051121

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound Number OSHA PEL (TWA) SRM Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS# LD50 Number 1000.0 1. Ammonium dihydrogen phosphate (P) 58115 121020 0.1000 200.0 0.084 1000 10000.3 2.2 7722-76-1 5 mg/m3 NA 3186

Nominal





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

In P. All

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	<0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	<0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	<0.02	Rb	< 0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	T	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Со	< 0.02	Ge	< 0.02	La	< 0.02	Мо	< 0.02	Pt	<0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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).

Part # **57015** Lot # **051121** 2 of 2 Printed: 5/17/2021, 11:15:11 PM

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### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

20370011

2.0%



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CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57082

 Lot Number:
 062221

Description: Lead (Pb)

**Expiration Date:** 062224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By: Lawrence Barry 062221

Lawrence Barry 062221

Reviewed By: Pedro L. Rentas 062221

**SDS Information** Expanded Part Lot Dilution Initial Uncertainty Nominal Initial Final Uncertainty (Solvent Safety Info. On Attached pg.) NIST Compound OSHA PEL (TWA) SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS# LD50

1000.0 2.2 1. Lead (II) Nitrate (Pb) 58182 032321 0.1000 200.0 0.084 1000 10000.1 10099-74-8 0.05 mg/m3 intrvns-rat 93 mg/kg 3128 [1] Spectrum No.1 [ 14.144 sec]:58082.D# [Count] [Linear] 1.0E5 5.0E4 m/z->10 20 зо 40 50 60 70 80 90 100 1.0E5 5.0E4 m/z->110 120 130 140 150 160 170 180 190 200 2.0E6 1.0E6 220 230 240 250 260 m/z->210



Certified by:

Bur P. All

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

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	< 0.02	Fe	<0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	T	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

### **Physical Characterization:**

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

- \* 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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- \* 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).

5.0E8

2.5E8

m/z->

210

220

230

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### Certified Reference Material CRM

ASTM Type 1 Water

051721



Expanded

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

**CERTIFIED WEIGHT REPORT:** Lot # Solvent:

> Part Number: 57016 Lot Number:

051721 **Description:** Sulfur (S)

**Expiration Date:** 051724

**Recommended Storage:** Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 1999.48 0.058 Flask Uncertainty Formulated By: Lawrence Barry 051721 Reviewed By Pedro L. Rentas 051721

**SDS Information** 

		Part	Lot	Dilution Initia	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On	Attached pg.)	NIST
	Compound	Number	Number	Factor Vol. (n	L) Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1.	Ammonium sulfate (S)	58116	011421	0.1000 199.	0.084	1000	10000.2	1000.0	2.2	7783-20-2	NA	NA	3181
	5.0E5	[1] Spectrum No	9.1 [	33.603 sec]:5	7016.D#	[Count] [Li	inear]						
	2.5E5-												
	m/z->	10	20	30	40		60	70	<del></del>	<b>ദ</b> ്ഠ	90	100	
	5.0E7												
	m/z->	110	120	130	140	150	160	17	0	180	190	200	

250

260

240



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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	<0.02	Dy	< 0.02	Hf	<0.02	Li	< 0.02	Ni	<0.02	Pr	< 0.02	Se	<0.2	Tb	<0.02	W	< 0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	T	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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.
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- \* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
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- \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57034

 Lot Number:
 070221

Description: Selenium (Se)

**Expiration Date:** 070224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

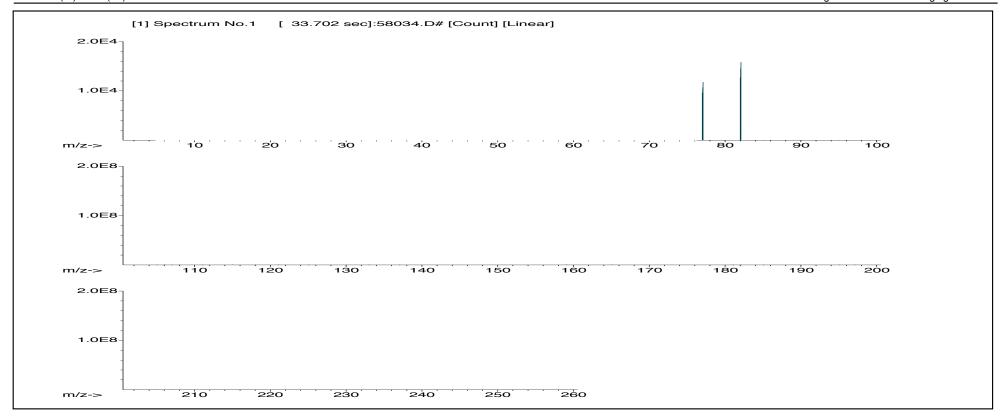
Formulated By: Giovanni Esposito 070221

Lector Denta 070221

Reviewed By: Pedro L. Rentas 070221

**SDS Information** 

	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	ent Safety Info. On A	Attached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
<ol> <li>Selenium(IV) oxide (Se)</li> </ol>	58134	021621	0.1000	200.0	0.084	1000	10000.2	1000.0	2.2	7446-08-4	0.2 mg/m3	orl-rat 68 mg/kg	3149





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Bu P. She

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

							Trace M	etals	<b>Verifica</b>	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	T	Tb	< 0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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

Part # 57034 Lot # 070221 Printed: 8/19/2021, 11:15:02 PM

<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.

<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.

<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

19410105

2.0%

Nitric Acid

Nitric Acid



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

**CERTIFIED WEIGHT REPORT:** Lot # Solvent:

> Part Number: 57014 030921 Lot Number:

Description: Silicon (Si)

60.0 **Expiration Date:** 030924 (mL)

**Recommended Storage:** Ambient (20 °C)

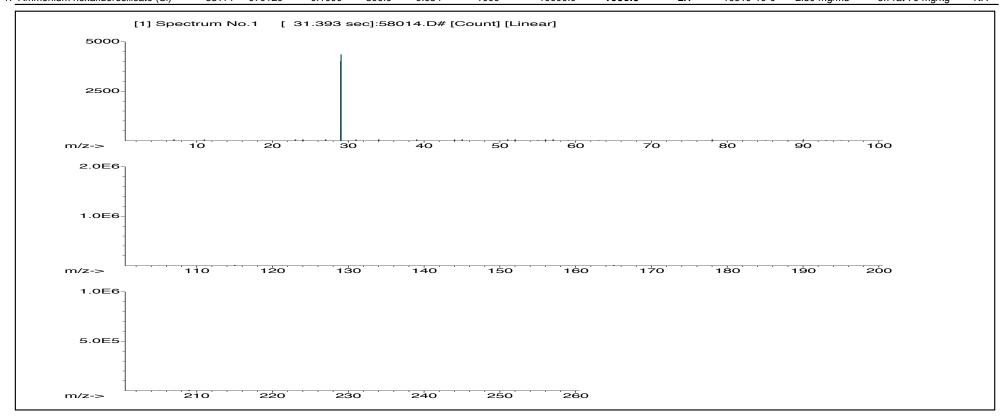
Nominal Concentration (µg/mL): 1000

> **NIST Test Number: 6UTB** 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 3000.41 0.058 Flask Uncertainty

Formulated By: Lawrence Barry 030921 Reviewed By: Pedro L. Rentas 030921

									Expanded		SDS Informat	ion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solve	ent Safety Info. On A	Attached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
Ammonium hexafluorosilicate (Si)	58114	070120	0 1000	300.0	0 084	1000	10000 0	1000.0	2.1	16919-19-0	2 50 mg/m3	orl-rat 70 mg/kg	NA





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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	<0.02	Dy	< 0.02	Hf	< 0.02	Li	< 0.02	Ni	<0.02	Pr	< 0.02	Se	<0.2	Tb	< 0.02	W	< 0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	T	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	T1	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	< 0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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).

Part # **57014** Lot # **030921** 2 of 2 Printed: 3/16/2021, 11:15:07 PM

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### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

**CERTIFIED WEIGHT REPORT:** Lot # Solvent:

> Part Number: 57047 Lot Number: 072921

**Description:** Silver (Ag)

**Expiration Date:** 072924

**Recommended Storage:** Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

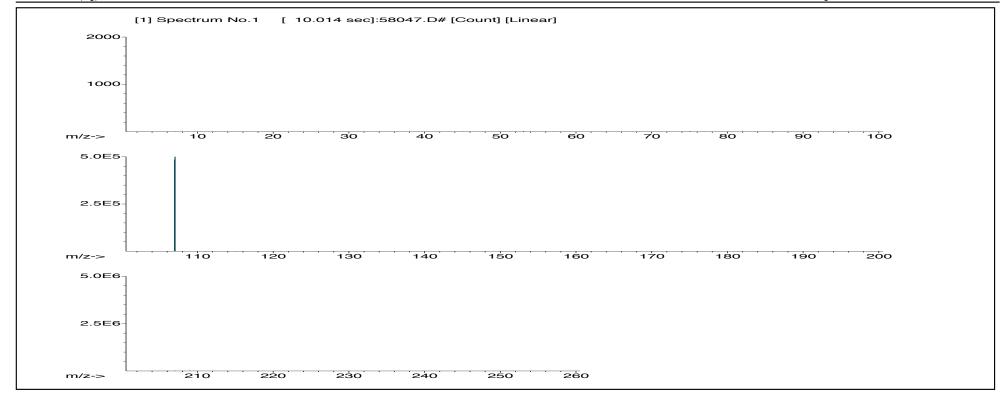
> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Liovanni Esporto Formulated By: Giovanni Esposito 072921 Reviewed By 072921 Pedro L. Rentas

**SDS Information** 

	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On At	tached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1. Silver nitrate (Ag)	58147	010820	0.1000	200.0	0.084	1000	10000.4	1000.0	2.2	7761-88-8	10 ug/m3	N/A	3151





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

Bu P. Sha

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	T	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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

Part # 57047 Lot # 072921 2 of 2 Printed: 8/19/2021, 11:15:10 PM

<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.

<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.

<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



Expanded

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

 CERTIFIED WEIGHT REPORT:
 Lot # Solvent:

 Part Number:
 57050
 19410105
 Nitric Acid

 Lot Number:
 021121
 240241
 Hydrochloric acid

 Description:
 Tin (Sn)

 Description:
 Tin (Sn)

 2.0%
 40.0
 Nitric Acid

 Expiration Date:
 021124
 6.0%
 120.0
 Hydrochloric acid

 Recommended Storage:
 Ambient (20 °C)
 (mL)

Nominal Concentration ( $\mu$ g/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 1999.78 0.265 Flask Uncertainty

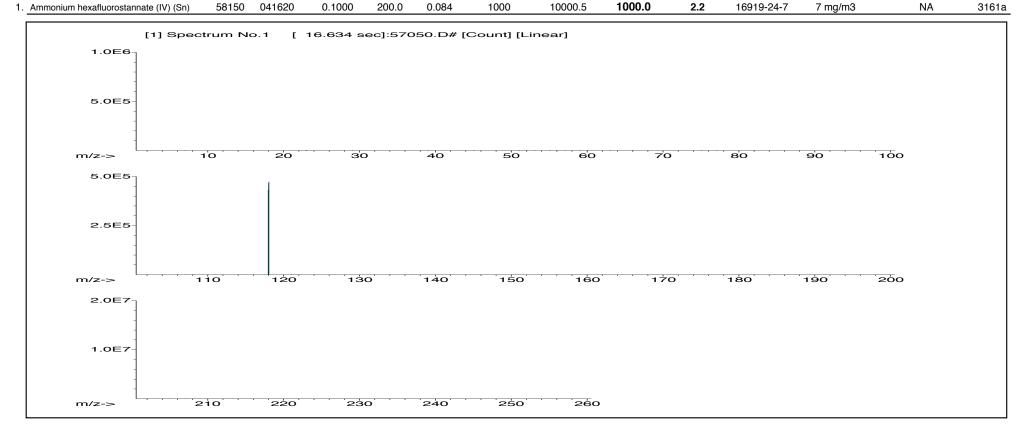
Formulated By: Lawrence Barry 021121

Lawrence Barry 021121

Reviewed By: Pedro L. Rentas 021121

**SDS Information** 

	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(So	lvent Safety Info. On Af	ttached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM





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

Bu f. All

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	<0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	T	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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).

Part # 57050 Lot # 021121 2 of 2 Printed: 2/23/2021, 11:15:13 PM

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### Certified Reference Material CRM

20370011



Formulated By:

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

070721

**CERTIFIED WEIGHT REPORT:** Lot # Solvent:

> Part Number: 57022 070721 Lot Number:

**Description:** Titanium (Ti)

2.0% 40.0 Nitric Acid

Nitric Acid

(mL)

**Expiration Date:** 070724

Nominal Concentration (µg/mL): 1000

**Recommended Storage:** 

**NIST Test Number: 6UTB** 5E-05 Balance Uncertainty Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

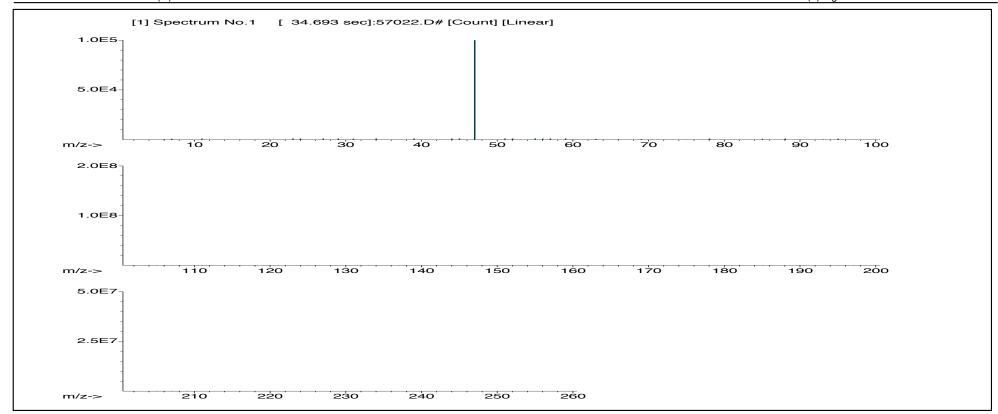
Ambient (20 °C)

Reviewed By: 070721 Pedro L. Rentas

Lawrence Barry

**SDS Information** Expanded Dilution Initial Final (Solvent Safety Info. On Attached pg.) NIST Lot Uncertainty Nominal Part Initial Uncertainty Compound CAS# OSHA PEL (TWA) LD50 SRM Number Number Factor Vol. (mL) Pipette Conc. (µg/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (µg/mL)

1000.0 16962-40-6 1. Ammonium hexafluorotitanate (Ti) 58122 070120 0.1000 200.0 0.084 1000 10000.1 2.2 2.5 (F) mg/m3 NA 3162a





Certified by:

Bu f. All

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

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	< 0.02	Dy	< 0.02	Hf	< 0.02	Li	< 0.02	Ni	< 0.02	Pr	< 0.02	Se	<0.2	Tb	< 0.02	W	< 0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	T	Zr	< 0.02

(T)= Target analyte

### **Physical Characterization:**

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

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

- \* 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).

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

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### Certified Reference Material CRM

20370011

Nitric Acid

40.0

(mL)

Nitric Acid



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57081

 Lot Number:
 073021

Description: Thallium (TI)

2.0% **Expiration Date:** 073024

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By: Giovanni Esposito 073021

Reviewed By: Pedro L. Rentas 073021

**SDS Information** Expanded Dilution Initial Final (Solvent Safety Info. On Attached pg.) NIST Lot Initial Uncertainty Nominal Part Uncertainty Compound CAS# OSHA PEL (TWA) LD50 SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (µg/mL)

1000.0 1. Thallium (TI) 58181 060920 0.1000 200.0 0.084 1000 10001.0 2.2 7440-28-0 0.1 mg/m3 orl-rat 6700 mg/kg 3158 [1] Spectrum No.1 [ 14.044 sec]:57081.D# [Count] [Linear] 2.0E6 1.0E6 10 20 30 40 60 70 80 90 100 m/z->50 1.0E4 5000 110 120 130 140 150 160 170 180 190 200 m/z->1.0E6 5.0E5 m/z-> 210 220 230 240 250 260



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

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	< 0.02	Dy	< 0.02	Hf	< 0.02	Li	< 0.02	Ni	< 0.02	Pr	< 0.02	Se	<0.2	Tb	< 0.02	W	< 0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	T1	T	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	< 0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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

Part # **57081** Lot # **073021** Printed: 8/20/2021, 11:15:04 PM

<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.

<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).

 $<sup>^{\</sup>star}$  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.

<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

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 58030

 Lot Number:
 031921

Description: Zinc (Zn)

Part

Expiration Date: 031924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Lot

Formulated By: Giovanni Esposito 031921

Licks Kenta

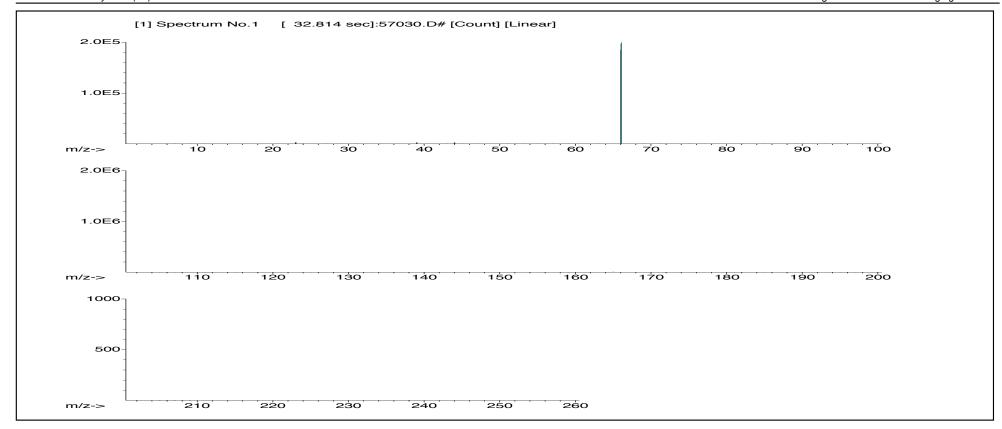
Reviewed By: Pedro L. Rentas 031921

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound OSHA PEL (TWA) SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS# LD50 1000.0 1. Zinc nitrate hexahydrate (Zn) 58130 082020 0.1000 200.0 0.084 1000 10000.3 2.2 10196-18-6 1 mg/m3 orl-rat 1190mg/kg 3168

Nominal





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

Bn f. Spla

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	< 0.02	Dy	< 0.02	Hf	< 0.02	Li	<0.02	Ni	< 0.02	Pr	< 0.02	Se	<0.2	Tb	<0.02	W	< 0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	T
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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.

<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.

<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).

 $<sup>\</sup>star$  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.

<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

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### Certified Reference Material CRM HPRHM 06/25/21

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

CERTIFIED WEIGHT REPORT: Part Number: 58126 Solvent: 20370011 Lot # Nitric Acid

Lot Number: Description: 061021

Iron (Fe)

Recommended Storage: **Expiration Date:** 061024 Ambient (20 °C)

Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): NIST Test Number: 10000 **6UTB** 3000.41 0.058 Flask Uncertainty 5E-05 Balance Uncertainty

Conc. (µg/mL)

(%)

Purity (%)

(%)

Weight (g)

Weight (g) Conc. (µg/mL)

+/- (µg/mL)

Reviewed By: Pedro L. Rentas

7.0%

210.0

Nitric Acid

Formulated By:

Giovanni Esposito

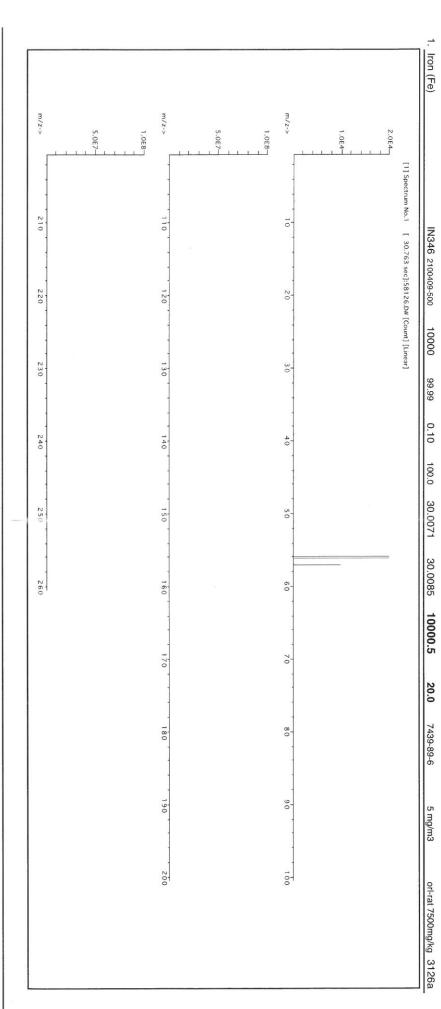
061021

Giovannie

arear L

(mL)

Compound Lot Nominal Purity Uncertainty Assay Target Actual Actual Expanded Uncertainty CAS# SDS Information
(Solvent Safety Info. On Attached pg.)
LD50 061021 TSIN SRM



Part # 58126



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

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

							Trace N	Metals	s Verificatior	-	by ICP-MS	S (µg,	)/L)						
A	<0.3	Cd	<0.1	Dν	<0.1	H	<0.1		<0.1	Z	75	Pr	<0.1	Se	<0.5	4T	<0.1	W	<0.1
Sb	^4	Ca	۵	Εī	<0.1	Но	<0.1	Lu	<u>6</u> .1	Ŋ.	<0.1	Re	<u> </u>	S:	<10	Te	<0.1	U	<0.3
As	۵	Се	<0.1	Eu	<0.1	In	<0.1	Ν	< 0.5	Os	<0.1	Rh	<0.1	Ag	<0.1	]	<0.1	<	<0.3
Ba	<0.1	Cs	<0.1	Gd	<0.1	Ιτ	<0.1	Mn	85	Pd	<0.1	Rb	<0.1	Na	۵	Th	<0.1	Yb	<0.1
Ве	<0.1	Cr	33	Ga	۵	Fe	Т	Hg	<0.1	P	<0.1	Ru	<0.1	Sr	<0.1	Tm	<0.1	~	<0.1
Bi	<0.1	Со	80	Ge	60	7	<0.1	Мо	۵	Pł	<0.1	Sm	<0.1	s	<0.1	Sn	۵	Zn	<45
В	<u>ئ</u>	Cu	50	Au	<0.1	РЪ	<0.3	Nd	<0.1	7	۵	Sc	<0.1	Ta	<0.1	Ti	<0.1	Zr	<0.1

(T)= Target 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). \* 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



Expanded

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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: 57005 MKBQ8597V Ammonium hydroxide

Lot Number: 031921
Description: Boron (B)

2.0% 40.0 Ammonium hy **Expiration Date:** 031924 (mL)

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

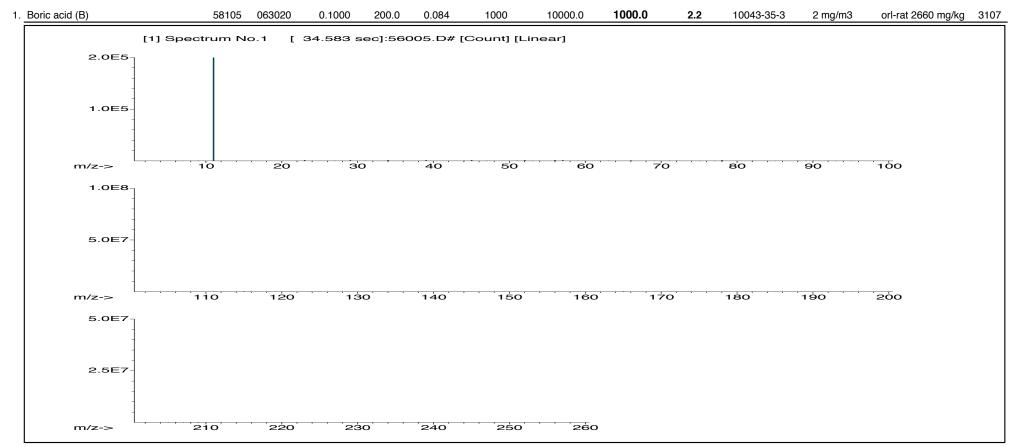
Formulated By: Giovanni Esposito 031921

Lista Henta

Reviewed By: Pedro L. Rentas 031921

**SDS Information** 

Part Lot Dilution Initial Uncertainty Nominal Initial Final Uncertainty (Solvent Safety Info. On Attached pg.) NIST Compound OSHA PEL (TWA) LD50 SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS#





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

Bu P. Sha

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	< 0.02	Dy	< 0.02	Hf	< 0.02	Li	< 0.02	Ni	< 0.02	Pr	< 0.02	Se	<0.2	Tb	< 0.02	W	< 0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	T	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	< 0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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

Part # 57005 Lot # 031921 2 of 2 Printed: 4/12/2021, 11:15:01 PM

<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.

<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).

 $<sup>^{\</sup>star}$  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.

<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).



m/z-> 210	5.0E7	1.0E8 5.0E7	2.0E5 1.0E5 1.0E5	1. Lithium nitrate (Li)	Volume shown below was diluted to (mL):  Part Lot Compound Number Number	Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number:	Part Number: Lot Number: Description:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT:
O		0	[ 32.093	58103	Part Number			
220		120	[ 32.093 sec]:58003.D# [Count] [Linear]	010320	Lot Number	Ambient (20 °C) 1000 23060	57003 030221 Lithium (Li)	
230		130	Ount] [Linear]	0.1000	2000.02 Dilution Factor	Ċ)		
A some subsequence and the same of				200.0	0.058 Initial Vol. (mL)	5E-05		
240		140	0	0.084	0.058 Flask Uncertainty Initial Uncertainty Nominal Vol. (mL) Pipette (mL) Conc. (µg/mL)	Balance Uncertainty		ertified R
250		150	50	1000	Nominal Conc. (µg/mL)	ainty	19410105 2.0%	eference
260		160	60		Initial Conc. (µg/mL) C			Certified Reference Material CRM   M.4   39
				1000.0	Final Conc. (µg/mL)		Nitric Acid	3
		170	76		11	Reviewed By:	Formulated	189
		180	80	7790-69-4	CAS	3	By:	
		190	90	5 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50	Pedro L. Rentas	Lawrence Barry	R: 09/22/N/ AR https
		200	100	ori-rat	ation Attached pg.) LD50	030221		(P)) (12) ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
					NIST			ccredited Number lards.com



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

As Ba	As Ba	As	טט	2	Αl	
0.01	70.02	3	40.2	<0.02	<0.02	
5	)	လ	၉	Ca	Cd	
6.02	S	40.02	<0.02	40.2	<0.02	
	Ga	2	Eu	中	Dу	
<0.02	40.02	40.02	<0.02	<0.02	<0.02	
<u>a</u> 4	ि स	뉴	5	Но	Hf	
6.02 20.02	40,2	<0.02	<0.02	<0.02	<0.02	Trace Mo
N Mo	Hg	Mn	Mg	Ŀ	Ε.	letals
A 60.02	8 62	<0.02	10.0>	<0.02	Т	Verifica
× 7	? 70	Pd	SO.	Ŋ	Z.	tion I
40.02	A0.02	<0.02	40.02	<0.02	<0.02	by ICP-M
Sc N	î P	Rb	Rh	Re	Pr	in) Si
60.02 20.02	40.02	<0.02	<0.02	<0.02	<0.02	g/mL)
T <sub>a</sub>	Sr	Na	Ag	S:	Se	
<0.02	0.02	40.2	<0.02	<0.02	<0.2	
II Y	Tm	Th	Ħ	Te	41	
<b>40.02</b>	40.02	<0.02	<0.02	<0.02	<0.02	
72	7 ×	4,4	<	C	×	
A0.02	0.02	40.02	<0.02	<0.02	<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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## Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: Description:

58149

100721

Indium (In)

R: 10/08/

Lot #

Solvent: 20370011 Nitric Acid

Dievannie

specific

5%

Nitric Acid

(III) 25.0

> Formulated By: Giovanni Esposito

> > 100721

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

10000

Recommended Storage:

**Expiration Date:** 

100724 Ambient (20 °C)

Weight shown below was diluted to (mL):

500.06

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

RM#

Number Lot

Conc. (µg/mL)

(%)

Purity (%)

8

Weight (g)

Weight (g) Conc. (μg/mL) +/- (μg/mL)

Target

Actual

Actual

Uncertainty

Nominal

Purity Uncertainty Assay

Pedro L. Rentas

Reviewed By:

100721

Expanded

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

> NIST SRM

5.0E7		Indium Oxide (In)
	[1] Spectrum No.1 [ 12.965 sec]:57049.D# [Count] [Linear]	IN086 W1096A 10000 99.999 0.10 82.6 6.05408 6.05441
	12.965	10000
	sec]:57	99.999
	049.D	0.10
	# [Cou	82.6
	nt] [Line	6.05408
	ar]	6.05441
		10000.6
		20.1
		1312-43-2
		NA
		NA
		3124a

m/z->	2.5E6	5.0⊑6	m/z->	1.0E6	2.0E6	m/z->	2.5E7	5.0E7
								[1] S
210			110			10		[1] Spectrum No.1
220			120			N O		
230			130			30		[ 12.965 sec]:57049.D# [Count] [Linear]
240			140			40		049.D# [Co
250			150			50		ount] [Linea
260			160			60		5
			170			70		
			180			80		
			190			90		
			200			100		

1 of 2



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

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

	-	Name of Street		-		and the	0,000	H		m Cys
	<b>B</b>	B.	Be	Ва	As	Sb	2			
	40.02	40.02	<0.01	40.02	40.2	<0.02	40.02			
	Cn	င္ပ	ť	S	င့	Ca	S			
	<0.02	<0.02	<0.02	<0.02	<0.02	40.2	<0.02			
		ဌ	Ga	ନୁ	먑	甲	Dy			
		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
	Pb	La	F	F	In	Но	Hf			
e Sico	<0.02	<0.02	<0.2	<0.02	-1	<0.02	<0.02		I race Me	1
	Nd	Мо	Hg	Mn	Mg	Lu	12		/letals	-
(T)= Target analyte	<0.02	<0.02	40.2	< 0.02	10.05	<0.02	<0.02		Verification	
analyte	×	Pt	P	Pd	0°	S,	Z		ion by	
	402	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		y ICP-MS	
	Sc	Sm	Ru	Rb	Rh	Re	Pr		(µg/	
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		mL)	
	Ta	s	Sr	Na	Ag	Si	Se		-	
	<0.02	<0.02	<0.02	40.2	<0.02	<0.02	40.2			The second secon
	П	Sn	Tm	Th	11	Te	1b			
	<0.02	40.02	40.02	40.02	<0.02	<0.02	<0.02			
	Zr	Zn	ч	4,4	<	C	W			The second second
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			

(I)= larger analyte

## Physical Characterization:

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

- \* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- \* Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- \* All standard containers are meticulously cleaned prior to use.
- \* Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- \* Standards are 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 # 58149

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

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### Certified Reference Material CRM 180/08



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

CERTIFIED WEIGHT REPORT: Part Number: Lot Number: 58139 Solvent: 20370011 Lot # Nitric Acid Remone

2%

Nitric Acid

Formulated By:

Lawrence Barry

052521

<u>a</u> 40.0

Reviewed By:

Pedro L. Rentas

052521

Description: 052521 Yttrium (Y)

Recommended Storage: **Expiration Date:** Ambient (20 °C) 052524

Nominal Concentration (µg/mL): NIST Test Number: **6UTB** 10000 5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Yttrium (III) Oxide (Y)

IN087 YV012015B1

10000

99.999

0.10

77.9

25.6744

25.6745 10000.0

20.0

1314-36-9

¥

									Expanded		SDS Information	
	Гot	Nominal	Purity	Purity Uncertainty Assay	Assay	Target	Actual	Actual	Uncertainty	_	(Solvent Safety Info. On Attached pg.)	NIST
Compound RM#	Number	Conc. (µg/mL)	(%)	Purity (%)	(%)	Weight (g)	Weight (g) C	Conc. (µg/mL)	Conc. (µg/mL) +/- (µg/mL) CAS#	CAS#	OSHA PEL (TWA) LD50	SRM

m/z->	1.0E5	2.0E5	m/z->	2.5E4	5.0€4	m/z->	1.0E6	2.056
210			110			0		
N						N		
220			120			20		ļ
230			130			30		
240			140			6		
250			150			50		
o <sub>.</sub>								
260			160			0		
			170			70		
			C					
			180			80		
			<u>,</u>			90		
			190			0		
			200			100		

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

	DE TOWN	40.02 Cil 40.03	<0007 Co	Be <0.01 C. A.D. G.	<0.02 Cs <0.02 Cd	<0.2 Ce <0.07 Fil	<0.02   Ca   <0.2   Er	<0.02 Cd <0.02 Dy		
	L	-		0.02						
	20.02	40.02	8	\$0.02	A0.02	A0.02	3	<0.02	Trace Me	
	Nd	Mo	gH.	ĭ Nn	Z 29		1 5	7.:	Metals	
(T)= Target	<0.02	<0.02	40.2	<0.02	<0.01	<0.02	10.01	A) 03	Verifica	
Target analyte	K	Pt	φ	Pd	o <sub>s</sub>	S	2	N.	tion On	
J	40.2	<0.02	<0.02	<0.02	<0.02	<0.02	20.02	2000	by ICP-	
	Sc	Sm	Ru	Rb	R	Re	77	7	NS C	
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	20.02	500	ua/mL)	
	Ta	s	Sr	Na	Ag	Si	Se	2		
	<0.02	<0.02	<0.02	40.2	<0.02	<0.02	202			
	Ti	Sn	Tm	T)	11	Te	10			
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	40.02			
The state of the s	Zr	Zn	×	ЧY	<	d	8			
The state of the s	<0.02	0.02	-1	<0.02	<0.02	<0.02	<0.02			

### 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).

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

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

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CERTIFIED WEIGHT REPORT:



## Certified Reference Material CRM

RA



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

011421 57116 Lot Number: Part Number:

Sulfur (S) Description:

Ambient (20 °C) 011424 **Expiration Date:** Recommended Storage:

10000 23060 Nominal Concentration (µg/mL): NIST Test Number: 1999.53

5E-05 Balance Uncertainty

ASTM Type 1 Water

011421

Solvent:

Fot #

Lawrence Barry Or Formulated By:

011421

011421 Pedro L. Rentas Reviewed By:

> 0.100 Flask Uncertainty Weight shown below was diluted to (mL):

Nominal

to Co

SDS Information (Solvent Safety Info. On Attached pg.) Uncertainty Expanded Actual Actual Target Purity Uncertainty Assay

NIST SRM OSHA PEL (TWA) CAS# +/- (ng/mL) Weight (g) Conc. (µg/mL) Weight (g) Z Purity (%) (%) Conc. (ug/mL) Number RM# Compound

3181 Ž ¥ 7783-20-2 20.2 10000.2 83.2206 83.2191 24.3 0.10 99.0 100001 IN117 SLBF9912V Ammonium sulfate (S)

Lot # 011421 Part # 57116

260

250

240

230

220

210

m/z->

1.0E5

## Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

The state of							I lace me	vetais	Verillication	5	יט עט	OM-	/nii/b						
Al	<0.02	ਤ	<0.02	Dy	<0.02	Ħ	<0.02	Ľ	<0.02	Z	<0.02	뀨	<0.02	Se	<0.2	Tb	<0.02	*	<0.02
Sp	<0.02	రౌ	40.2	占	<0.02	H	• <0.02	٦	<0.02	£	<0.02	8	<0.02	S.	<0.02	Te	<0.02	n	<0.02
As	402	ප	<0.02	岀	<0.02	되	<0.02	Mg	<0.01	ő	<0.02	찐	<0.02	Ag	<0.02	F	<0.02	>	<0.02
Ba	<0.02	ొ	<0.02	B	<0.02	긔	<0.02	M	<0.02	R	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	χp	<0.02
Be	40.01	ర	<0.02	g <sub>a</sub>	<0.02	Fe	40.2	Hg	<0.2	Д,	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	ප	<0.02	g	<0.02	Z.	<0.02	Mo	<0.02	표	<0.02	Sm	<0.02	S	Н	Sn	<0.02	Zn	<0.02
В	<0.02	♂	<0.02	Au	<0.02	Pb	< 0.02	PN	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	Ή	<0.02	Z	<0.02

Physical Characterization:

(T)= Target analyte

Certified by:

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

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CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 57115 032921

Solvent: 20370011

Nitric Acid

Lot #

2%

Nitric Acid

Formulated By:

Lawrence Barry

032921

Laronce

(mL) 60.0

Description: Phosphorous (P)

Recommended Storage: **Expiration Date:** Ambient (20 °C) 032924

**NIST Test Number: BTU9** 

Nominal Concentration (µg/mL): Weight shown below was 10000 5E-05 Balance Uncertainty

	s diluted to (mL):	0
	3000.41	•
	3000.41 0.058 Flask Uncertainty	CE-US Balance Uncertainty
Expanded		Reviewed By:
SDS Information		Pedro L. Rentas
-	00000	032921

NIST SRM 3186

	<ol> <li>Ammonium dihydrogen phosphate (P)</li> </ol>			Compound		
	IN008 PV052018A1		MAIN	BM#		
	V052018A1		1	Nimber	בטנ	2
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	10000.3		) Conc. (ug/mL) +/- (ug/ml) CAS#		Actual	
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# Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

40.02 Ni 40.02 Pr 40.02 Nb 40.02 Re 40.01 Os 40.02 Rb 40.02 Pd 40.02 Rb 40.02 Pr 40.02 Sm 40.02 Pr 40.02 Sc	A002   Cd   A002   Dy   A002   Hf   A002   Li   A002   Ni   A002   Pr   A002   Si   A002   A002   Ce   A002   Gd   A002   Fr   A002   Fr   A002   Mg   A002   Pr   A002   Ni   A002   Rr   A002   Ni   A002   Rr   A002   Ni   A002   Ni		1						lyte	Target analyte	(T)= Tan									
A002   Cd   A002   Dy   A002   Hf   A002   Li   A002   Ni   A002   Pr   A002   Sc	A002   Cd   A002   Dy   A002   Hf   A002   Li   A002   Ni   A002   Pt   A002   Si	40.02	11		<0.02	Ta	<0.02	Sc	40.2	7	20.02	DAT	70.02	10	20.02					
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A002   Cd   A002   Dy   A002   Hf   A002   Li   A002   Ni   A002   Pr   A002   Se   A002	Cd   OD2   Dy   OD2   Hf   OD2   Li   OD2   Ni   OD2   Ri   OD2   Se   OD2	499		7		Z	A).02	Rb	<0.02	Pd	<0.02	Mn	20.02	=	20.02	2	10.01	) (	5	0
40.02   Cd   40.02   Dy   40.02   Hf   40.02   Li   40.02   Ni   40.02   Pt   40.02   Si   40.02   Ce   40.02   Eu   40.02   In   40.02   Mg   40.01   Co   Co   Co   Co   Co   Co   Co   C	1	40.02			_	Ag	40.02	8	20.02	Ş	10.07	147	20.02	-	3	5	200	Š	A).02	Ba
-0.02   Cd   -0.02   Dy   -0.02   Hf   -0.02   Li   -0.02   Ni   -0.02   Pr   -0.02   Se   -0.02   Oct   -0.02   Cd   -0.02   Cd   -0.02   Ho   -0.02   Lu   -0.02   Nh   -0.02   Rc   -0.02   Cd   -0.02   Cd   -0.02   Cd   -0.02   Cd   -0.02   Cd   -0.02   -0.0	\( \frac{40.02}{40.02} \)   Cd   \( \frac{40.02}{40.02} \)   Er   \( \frac{40.02}{40.02} \)   Hi   \( \frac{40.02}{40.02} \)   Li   \( \frac{40.02}{40.02} \)   Ni   \( \frac{40.02}{40.02} \)   Fr   \( \frac{40.02}{60.02} \)   Se   \( \frac{40.2}{60.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{40.02} \)   Hi   \( \frac{40.02}{40.02} \)   Li   \( \frac{40.02}{40.02} \)   Ni   \( \frac{40.02}{40.02} \)   Fr   \( \frac{40.02}{60.02} \)   Se   \( \frac{40.2}{60.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{40.02} \)   Hi   \( \frac{40.02}{40.02} \)   Li   \( \frac{40.02}{40.02} \)   Ni   \( \frac{40.02}{40.02} \)   Fr   \( \frac{40.02}{60.02} \)   Se   \( \frac{40.2}{60.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Hi   \( \frac{40.02}{40.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Hi   \( \frac{40.02}{40.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Hi   \( \frac{40.02}{40.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Hi   \( \frac{40.02}{40.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Hi   \( \frac{40.02}{60.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Hi   \( \frac{40.02}{60.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Hi   \( \frac{40.02}{60.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Er   \( \frac{40.02}{60.02} \)   Cd   \( \frac{40.02}{60.02} \)   Er   \	20.02		E	_	2	20.02	! ?	0 0	?	2	No.	A) 02	<b>T</b>	40.02	띹	40.02	ئ د	40.2	As
40.02   Cd   40.02   Dy   40.02   Hf   40.02   Li   40.02   Ni   40.02   Pr   40.02   Sc   40.2   Cd   40.02   Sc   40.2   Cd   40.02   Sc   40.2   Cd   40.02   Pr   40.02   Sc   40.2   Cd   40.02   Cd   40.02   Pr   40.02   Cd   40.02	40.02   Cd   40.02   Dy   40.02   Hf   40.02   Li   40.02   Ni   40.02   Pt   40.02   Sc   40.2   Cd   40.02   Sc   40			3		?	3	R	40.02	3	40.02	Ē	<0.02	Но	40.02	T.	20.2	2	20.02	
4002   Cd   A002   Pu   A002   Fu   A002   Cd   A002   Cd   A002   Pu   A002   A002	Trace Metals Verification by ICP-MS (µg/	w com	1	7	4	Se	40.02	7	₹0.02	Z	<0.02		20.02	н	20.02	Ş	20.02	2	3	3
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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).

2 of 2





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

Instructions for QATS Reference Material: ICP-AES ICS

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

**NOTE:** These instructions are for advisory purposes only. If any apparent conflict exists between these instructions 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 Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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







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

### Instructions for QATS Reference Material: ICP-AES ICS

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

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

**ICSA-1211**, **Interferents:** Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-AES.

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

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

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211,
AND ICSA-1211 MIXED WITH ICSB-0710

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

ICSA M5126 M5127 M5128 M5129 M5130

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

value  $\pm$  15 percent of the listed certified value.

**ICSB** 

M5219

M5220

M5221

M5222

M5223

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## Certified Reference Material CRM

R: 6/2/22

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

CERTIFIED WEIGHT REPORT: Manganese(II) nitrate tetrahydrate (Mn) Compound Nominal Concentration (µg/mL): m/z-> m/z-> m/z-> 5.0E7 1.0E8 5.0E7 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: 210 110 10 58125 Number Part **BTU9** 1000 58025 060122 Ambient (20 °C) 060125 Manganese (Mn) 021022 Number 120 220 20 Lot [ 34.243 sec]:57025.D# [Count] [Linear] 3000.41 0.1000 Dilution Factor 230 130 30 M5184 Vol. (mL) Pipette (mL) Conc. (µg/mL) 300.0 0.058 Flask Uncertainty 5E-05 Initial Balance Uncertainty 140 Uncertainty 240 40 0.084 20510011 Nominal Lot # 2.0% 1000 150 250 50 Conc. (µg/mL) Nitric Acid Solvent: 10000.5 Initial (mL) 60.0 260 160 60 Conc. (µg/mL) Nitric Acid 1000.0 Final 170 70 Formulated By: Reviewed By: Uncertainty +/- (µg/mL) Expanded 2.1 180 Ferne 80 20694-39-7 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) 190 Pedro L. Rentas Lawrence Barry 90 SDS Information 5 mg/m3 100 200 orl-rat >300mg/kg 060122 060122 3132 TSIN SRM

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

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<0.02	Y	<0.02	Tm	<0.02	Sr	<0.02	Ru	<0.02	ъ	40.2	Hg	40.2	Fe	<0.02	Ga	<0.02	Ω.	40.01	Ве
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(T)= Target analyte

### Physical Characterization:

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

Certified by:



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

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

# 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:

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

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

Part # 57042

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:

58120 082021 Solvent: 20370011 Lot # Nitric Acid

Lot Number: Description: Calcium (Ca)

Recommended Storage: **Expiration Date:** 082024

2%

60.0 (<u>1</u>)

Nitric Acid

Formulated By:

Giovanni Esposito

082021

Pedro L. Rentas

082021

SDS Information

Horana

Laborate

Ambient (20 °C)

Nominal Concentration (µg/mL): NIST Test Number: **BTU3** 10000

Weight shown below was diluted to (mL): 3000.4 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Expanded

Uncertainty ) +/- (µg/mL)	(Solven	nt Safe OSHA
	+/- (μg/mL)	t/- (µg/mL) CAS#
Lot Nominal Purity Uncertainty Assay Target Actual Actual Uncertainty (Solvent Safety Info. On At Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)	t Safety Info. On At OSHA PEL (TWA)	
(Solvent Safety Info. On Attached pg.)  CAS# OSHA PEL (TWA) LD50 SRM	4	tached pg.)

m/z->	5.0M4	m/z->	2.5 🖽	m/z->	1.0E4	2.0∈4
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		130		۵		12.514
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		180		80		
		190		90		
		N 00		100		

## Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

							Trace Me	stals	Verifica	tion	by ICP-N	VIS (	(ua/ml)							
																	The second state of the second			T
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## Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 082021

2 of 2

<sup>\*</sup> 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.

<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.

<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



## Certified Reference Material CRM

0



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number:

Lot #

Solvent: 20370011 Nitric Acid

2%

60.0 (IE)

Nitric Acid

Formulated By:

Giovanni Esposito

092121

Pedro L. Rentas

092121

SDS Information

Giranie

rapider

Description: Sodium (Na)

092121 58111

Recommended Storage: **Expiration Date:** 092124

Ambient (20 °C)

Nominal Concentration (µg/mL): 10000

Weight shown below was diluted to (mL): **NIST Test Number: 6UTB** Lot 3000.41 Nominal 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity Uncertainty Assay Target Actual Actual Uncertainty Reviewed By: Expanded

g 3152a	orl-rat 3236 mg/kg 3152a	5 mg/m3	7631-99-4	20.0	10001.4	111.1274 111.1433	111.1274	27.0	0.10	99.999	10000 99.999	IN036 NAV01201511	IN036	1. Sodium nitrate (Na)
SRM	LD50	OSHA PEL (TWA)	CAS#	+/- (µg/mL)	) Conc. (µg/mL) +/- (µg/mL) CAS#	Weight (g)		(%)	Purity (%)	(%)	Conc. (µg/mL)	Number	RM#	Compound
NIST	tached pg.)	(Solvent Safety Info. On Attached pg.)	(So	Uncertainty	Actual	Actual	Target	Assay	Purity Uncertainty Assay		Nominal	Lot	!	

							-
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		ŏ		ŏ			orl-rat 3236 mg/kg 3152
							153



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

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

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Sc	Sm	Ru	Rb	Rh	Re	Pł		d) SV	
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Ta	S	Sr	Na	Ago	Si	Se			
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Physical Characterization:

(I)= Target analyte

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.

<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.

<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 NIŞT (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).



Mellona

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

10/0/12

Fot #

Nitric Acid Solvent: 20370011 Potassium (K) 062321 57119

> Lot Number: Description:

Part Number:

CERTIFIED WEIGHT REPORT:

40.0 (mL) %

Nitric Acid

NIST 062321 062321 SDS Information
(Solvent Safety Info. On Attached pg.) Pedro L. Rentas Gabriel Helland CAS# Formulated By: Reviewed By: Weight (g) Conc. (µg/mL) +/- (µg/mL) Uncertainty Expanded Actual Actual Weight (g) Target Uncertainty Assay 8 5E-05 Balance Uncertainty 0.058 Flask Uncertainty Purity (%) Purity (%) Conc. (µg/mL) 2000.02 Nominal Ambient (20 °C) Weight shown below was diluted to (mL): 062324 Number 10000 **6UTB** ĕ RW# **Expiration Date:** Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Compound

Potassium nitrate (K)		IN034 KZ062019A1 10000	10000	866.66	0.10	38.2	52.3570	52.3590	0.10 38.2 52.3570 52.3590 10000,4 20,0 7757-79-1	20.0	7757-79-1	5 ma/m3	od-rat 3015 molec 3141a
	[1] Spectru	[1] Spectrum No.1 [ 35.763 sec]:581	35.763	sec]:58	119.D#	Cou	19.D# [Count] [Linear]	ari					Bull
2.0E6						ı							
1.0E6													
m/z->	0	80	Ø	30	6		90	00	70		90	06	100

Lot # 062321 Part # 57119

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250

230

210

<-z/ш

5000

200

190

180

170

160

150

140

130

120

110

1.0E4 m/z->

2.0E5

1.0E5

## Certified Reference Material CRM





AR-1539 Certificate Number https://Absolutestandards.com

ANAB ISO 17034 Accredited

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

							Trace Me	etals	Verifical	ation	by ICP-MS	VIS	(ng/mL)						
		ALCONOMICS.		STATE STATE OF		Sec. at Column	SAMPLE SECTION SECTION	THE DESIGNATION	Secretary and a second										
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Be	<0.01	Ċ	<0.02	Ča	<0.02	æ	402	Hg	<0.2	Ы	<0.02	Ru	<0.02	Şr	<0.02	Tm	<0.02	7	<0.02
Bi	<0.02	රි	<0.02	ප	<0.02	2	<b>₹0.02</b>	Mo	<0.02	K	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	ರೆ	<0.02	Au	<0.02	Ps	<0.02	PN	<0.02	X	L	ઝ	<0.02	Ta	<0.02	F	<0.02	77	<0.02

### Physical Characterization:

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



(T)= Target analyte



\* 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.

\* 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.



### 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: CHEM-QC-4

Lot Number: S2-MEB711674

Matrix: 3% (v/v) HNO3
 3% (v/v) HF

3 /0 (V/V) I II

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

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

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Boron, B  $1\,000\pm7\,\mu\text{g/mL}$  Molybdenum, Mo  $1\,000\pm5\,\mu\text{g/mL}$  Silicon, Si  $1\,000\pm7\,\mu\text{g/mL}$  Tin, Sn  $1\,000\pm5\,\mu\text{g/mL}$ 

Titanium, Ti  $1 001 \pm 6 \mu g/mL$ 

**Density:** 1.032 g/mL (measured at 20  $\pm$  4 °C)

### **Assay Information:**

ANALYTE	METHOD	NIST SRM#	SRM LOT#
В	ICP Assay	3107	110830
Мо	ICP Assay	3134	130418
Si	ICP Assay	3150	130912
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

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

### Characterization of CRM/RM by Two or More Methods 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 ( $u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$ )<sup>1/2</sup> 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 u<sub>lts</sub> = 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.

### 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

November 02, 2021

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

### 11.2 Lot Expiration Date

- November 02, 2026

- Sealed TCT Rag Open Date:

- 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

Could To F Bug opon Buto		=	
This CDM/DM should not be us	and langer than one year (or give	months in the case	of a 20 m

- Inis 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





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

Instructions for QATS Reference Material: ICP-AES ICS

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

**NOTE:** These instructions are for advisory purposes only. If any apparent conflict exists between these instructions 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 Aqueous Reference Material, each composed of metals at various concentrations and prepared with nitrate salts and oxy-acids of the respective elements in a 5% nitric acid matrix. For the reference material source in reporting ICSA and ICSAB mixture use "USEPA". For the reference material lot number for the ICSA use "ICSA-1211" and for the ICSAB mixture use "ICSA-1211+ICSB-0710".

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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







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

### Instructions for QATS Reference Material: ICP-AES ICS

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

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

**ICSA-1211**, **Interferents:** Pipet 10 mL of the ICSA solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSA solution by ICP-AES.

ICSB-0710, Analytes, mixed with ICSA-1211, Interferents: Pipet 10 mL of the ICSA solution and 10 mL of the ICSB solution into a 100 mL volumetric flask and dilute to volume with 2% v/v HNO<sub>3</sub>. Analyze this ICSAB solution by ICP-AES.

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

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

Table 1. "CERTIFIED VALUES" FOR INTERFERENCE CHECK SAMPLE ICP-AES ICSA-1211,
AND ICSA-1211 MIXED WITH ICSB-0710

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

ICSA M5126 M5127 M5128 M5129 M5130

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

value  $\pm$  15 percent of the listed certified value.

**ICSB** 

M5219

M5220

M5221

M5222

M5223

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### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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

NIST

**CERTIFIED WEIGHT REPORT:** Lot # Solvent:

> Part Number: 57051 101521 Lot Number:

**Description:** Antimony (Sb)

Part

**Expiration Date:** 101524

**Recommended Storage:** Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

> > Dilution

Initial

Uncertainty

Volume shown below was diluted to (mL): 2000.25 0.116 Flask Uncertainty

Lot

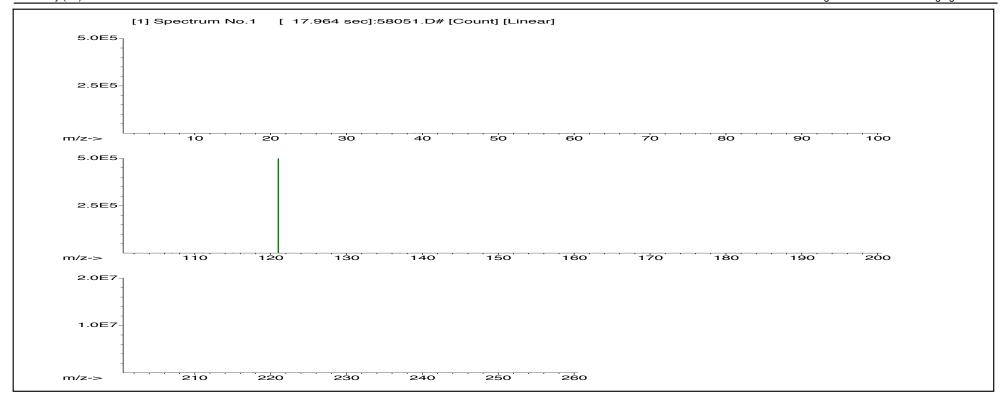
Giovanni Esposito Giovanni Esposito Formulated By: 101521 Reviewed By Pedro L. Rentas 101521

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
<ol> <li>Antimony (Sb)</li> </ol>	58151	081820	0.1000	200.0	0.084	1000	10001.5	1000.0	2.2	7440-36-0	0.5 mg/m3	orl-rat 7000 mg/kg	3102a

Nominal



### Certified Reference Material CRM



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

Bu f. Spa

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

							Trace M	etals	Verifica	tion	by ICP-M	S (μ	g/mL)						
Al	<0.02	Cd	< 0.02	Dy	< 0.02	Hf	< 0.02	Li	< 0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	< 0.02	W	<0.02
Sb	T	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	T1	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	< 0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization: Certified by:

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.

Part # 57051 Lot # 101521 2 of 2 Printed: 11/22/2021, 11:15:06 PM

<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.

<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.

<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).

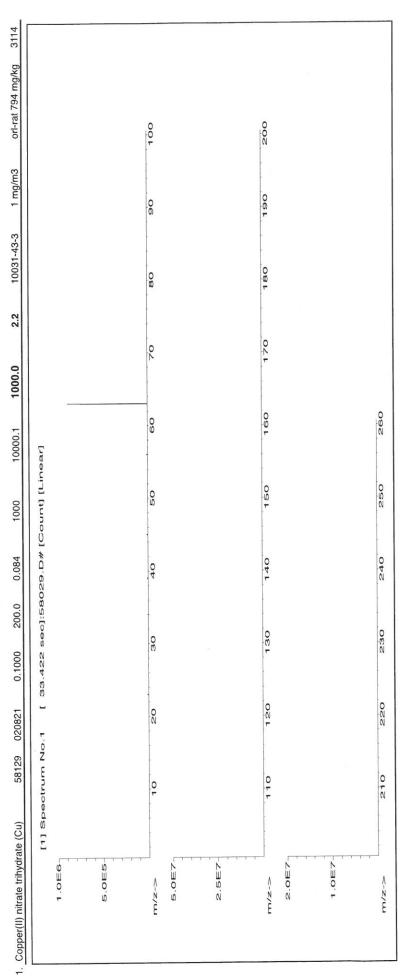
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com

W52仏 Certified Reference Material CRM

**B** 

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

CERTIFIED WEIGHT REPORT:						Fot #	Solvent:						F
Part Number: Lot Number:		58029 022822				20370011	Nitric Acid		Lionannie	rie 6	aposto		
Description:		Copper (Cu)	257						7		_		_
						2.0%	40.0	Nitric Acid F	Formulated By:		Giovanni Esposito	022822	οιI
Expiration Date:		022825					(mL)		1		1		
Recommended Storage:		Ambient (20 °C)	<u>()</u>						1	M	on the		
Nominal Concentration (µg/mL):	1000	0							June 1				
NIST Test Number:	: 6UTB	9		5E-05	Balance Uncertainty	inty		لث	Reviewed By:		Pedro L. Rentas	022822	ភា
Volume shown below was diluted to (mL):	was diluted to		2000.02	0.058	Flask Uncertainty								
									Expanded		SDS Information		
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solve	(Solvent Safety Info. On Attached pg.)	thed pg.)	NIST
Compound	Number Number	umber	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Vol. (mL) Pipette (mL) Conc. (μg/mL) Conc. (μg/mL) +/- (μg/mL)		CAS#	OSHA PEL (TWA)	LD50	SRM







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

							Trace M	Metals	Verifica	tion	by ICP-M	S (µg	J/mL)						
											The state of the s	<b>MANAGEMENT</b>	<b>RESIDENCE SERVICE</b>		<b>CPSTREETINGENERAL</b>	REPUBLISH			SCHOOL STREET,
Α	<0.02	Cd	< 0.02	Dy	<0.02	ЭH	< 0.02	Li	<0.02	Z.	< 0.02	Pr	<0.02	Se	<0.2	ďЪ	<0.02	*	<0.02
Sb	< 0.02	Ca	< 0.2	E	<0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	S:	< 0.02	Te	<0.02	C	<0.02
As	<0.2	Се	< 0.02	Eu	<0.02	In	< 0.02	Mg	<0.01	Os	< 0.02	Rh	< 0.02	Ago	<0.02	1	<0.02	<	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	<0.02	İr	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	<0.02	ΥЬ	<0.02
Ве	< 0.01	Cr	< 0.02	Ga	<0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	<0.02	4	<0.02
<u>B</u> :	< 0.02	Co	< 0.02	Ge	<0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	T	Au	<0.02	Pb	<0.02	Nd	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02
									(T)- Target analyte	analyta									

(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.

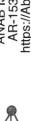
  \* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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יוממוי			100121	Ī	100121	1	:	z v											
2000		1	100		100			1 pg.) LD50	orl-rat 630 mg/kg										
2							uo .	tached	orl-rat 6				100			200			
		B	osito	/	tas		ormatic	o. Un At TWA)					F			Ñ			
		200	Giovanni Esposito	1 /3	Pedro L. Rentas		SDS Information	OSHA PEL (TWA)	1.0 mg/m3				0			00			
		B	Gio	18	Ped		0)	(Solvent Safety Info. On Attached pg.)  # OSHA PEL (TWA) LD50					06			190			
		vri.		, ,			Š	CAS#	7803-55-6							0			
		Liorannie	ted By:	14	d By:		pa	Inty /mL)					8			180			
)		五	Formulated By:	16	Reviewed By:		Expanded	uncertainty +/- (µg/mL)	2.1							0			
,			Nitric Acid			n	-	ıaı vg/mL)	1000.0				70			170			
			Nitrio				Ė	Conc. (	100										
	Solvent:	Nitric Acid	0.09	(mL)			1	Conc. (µg/mL) Conc. (µg/mL)	10000.4	-			9			160			260
	S	N. T.					-		1 1	inear									
	Lot #	20370011	2.0%				i i i i	(mL) Pipette (mL) Conc. (µg/mL)	1000	unti [L			50			150			250
	_	20			certainty	rtainty		ry Conc		Con									
					Balance Uncertainty	Flask Uncertainty	- Incord	oncertain	0.084	23.D#			40			140			240
					5E-05	0.06 F	<u>.</u>	ol. (mL) F	300.0	34.243 sec]:58023.D# [Count] [Linear]			ŀ						
					2			_		3 sec			30			130			230
		S		(ĵ		3000.4	Citition	Factor	0.1000	2.24									
		57023 100121 Vanadium (V)		100124 Ambient (20 °C) <b>1000</b>	m	(mL):	to	Number	070721	- C			20			120			220
)		57023 100121 Vanadiu		100124 Ambient 1000	<b>6UTB</b>	uted to		- 1	1 1	, 0 Z									
						Volume shown below was diluted to (mL):	Dart	Number	58123	[1] Spectrum No.1			10			110			210
		Part Number: Lot Number: Description:		Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	NIST Test Number:	n pelow				Spec						٦			N
	ORT	Part N Lot N Desc		Expirati lended tration	T Test	shown			date (V)		 								
	HT REP			concer	N	Volume			etavana	2.0E6	1.0E6		W/z->	2.0E7	1.0E7	٨	5.0E8	2.5E8	m/z->
	WEIGH			A ominal				puno	nium Me	.,	,		Ë	W	,	~-z/w	47		Ë
	CERTIFIED WEIGHT REPORT:			ž				Compound	1. Ammonium Metavanadate (V)										
	핑								<del>-</del> -										

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## Certified Reference Material CRM



Absolute Standards, Inc.

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

							Trace M	Matale	Varifica	<u>-</u>	hy ICD N	0	( lm/ 5		- 1 0 dd dd				
							٠,	200	- 1		2 6	3	9/1111/						
								The state of the s	STATE OF STREET, STREE				Secretary care and			School of the latest of			
F	<0.02	3	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	ī	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	CB	<0.2	Ξ	<0.02	Но	<0.02	Lu	<0.02	<sup>Q</sup> N	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	ם	<0.02
As	<0.2	ပိ	<0.02	En	<0.02	In	<0.02	M	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	I	<0.02	>	-
Ва	<0.02	Cs	<0.02	PS	<0.02	1	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Į	<0.02	Υ Υ	20.0>
Be	<0.01	ڻ	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Ь	<0.02	Ru	<0.02	S	<0.02	E	200>	>	20:07
Bi	<0.02	ပိ	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	£	<0.02	Sm	<0.02	S	<0.02	S.	20.02	7, 2	20.02
В	<0.02	Cu	<0.02	Αn	<0.02	Pb	<0.02	PN	<0.02	×	<0.2	Sc	<0.02	Та	<0.02	Ë	<0.05	7.	20.02
						The same of the sa	The second secon		The same of the sa									į	70.05

(T)= Target analyte

### Physical Characterization:

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



Certified by:

the preparation of all standards.

<sup>\*</sup> 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.

<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). \* 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.

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

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	Ti
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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







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

<u> </u>	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Trace Metals Verification by ICP-MS (ua/mL)	   <0.02   Dy   <0.02   Hf   <0.07   1;   <0.07   Ni   <0.10   Pr   <0.02	50.2 Th <0.02 W	40.2 ET 40.02   Ho 40.02   Lu   40.02   Nb   40.02   Re   40.02   Si   40.02   To   20.02   To	< CO02 Eu < CO02 Fu < CO02 Fu < CO02 Fu < CO02 Fu < CO02 < CO03 < CO03 < CO03 < CO0	 <0.02 Gd <0.02 Ir <0.02 Ma <0.10 Pd <0.07 Rb <0.07 No. <0.02 No.	CO Co CO Les AO 10 CO LO TO	12	Co <0.10   Ge <0.10   La <0.02   Mo <0.02   Pr <0.07   Sm <0.00   Sm <0.00	2010 An 2000 But 2000 Sin 2000	
	0.000		Ĺ			_	_	_		_	_	

(T)= Target analyte

### Physical Characterization:

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





Lot # 020422

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.

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.

<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).



### QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY

"An ISO 9001:2015 Certified Program"

R1.02/20/21

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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 CLP SOWs 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

QATS Form 20-007F169R05, 05-17-2018

### (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.



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 use: dilute the ICV1 concentrate 10-fold with 2% (v/v) nitric acid; pipet 10 mL of the concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.

Page 1 of 2

ICV 1, 5, 6.docx



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





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

R! 02/20/20

**APTIM** 

### Instructions for QATS Reference Material: Inorganic ICV Solutions

For ICP-MS use: dilute the ICV1 concentrate 50-fold with 1% (v/v) nitric acid; pipet 2 mL of the 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: dilute the ICV5 concentrate 100-fold with 2% (v/v) nitric acid; pipet 1 mL of the 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: dilute the ICV6 concentrate 100-fold with Type II water; pipet 1 mL of the 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

42.1	ICV1-1014	
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (μg/L) (after 50-fold dilution)
AI	2520	504
Sb	1010	202
As	997	199
Ba	518	104
Be	514	103
Cd	514	103
Ca	10000	2000
Cr	517	103
Co	521	104
Cu	505	101
Fe	10100	2020
Pb	1030	206
Mg	5990	1198
Mn	524	105
Ni	525	. 105
K	9940	1988
Se	1030	206
Ag	252	50
Na	10100	2020
Ti	1040	208
V	504	101
Zn	1010	202

	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

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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):

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					-	2 4	70:05	DAT -	70:02	4	7.8	2	ZI) (12	, «	2002	ř	Ş	1	200

Physical Characterization:

(T)= Target analyte

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.

<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> 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.

Certified Deference Metaric Com

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Certified Reference Material CRM
[N 403 | 20 | 128 | 125 | 1

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

070622 070622 Pedro L. Rentas Lawrence Barry Formulated By: Reviewed By: Nitric Acid Nitric Acid 20510011 Fot # 20.0 (mL) Solvent: 2% 0.058 Flask Uncertainty 5E-05 Balance Uncertainty 1000.12 Ambient (20 °C) Lithium (Li) Weight shown below was diluted to (mL): 57103 070622 070625 10000 **6UTB** Nominal Concentration (µg/mL): NIST Test Number: Lot Number: Description: Expiration Date: Recommended Storage: Part Number: CERTIFIED WEIGHT REPORT:

Γ						ar]	[ 9.619 sec]:58103.D# [Count] [Linear]	# [C	58103.D	sec]::	_	No.1	ctrum	[1] Spectrum No.1	
5	Byfill 0241 ischin	2					1000								
MA	0.10 10.0 100.0134 100.0173 10000.4 20.0 7790-69-4 5 ma/m3 nd-sat 1428 ma/m NA	5 ma/m3	7790-69-4	20.0	10000.4	100.0173	100.0134	10.0	0.10	99.999	10000 89.889 0.	IN019 UZ042018A1	IN019		Lithium nitrate (Li)
SEM	LD50	RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50	CAS#	+/- (ug/mL)	Conc. (ug/mL)	Weight (g)	Weight (g)	(%)	Purity (%)	(%)	Conc. (µg/mL)	Number	RM#		БПроппа
	Attached oc.)	(Solvent Safety Info. On Attached pg.)	(Solv	Uncertainty	Actual	Actual	Target	Assay	Nominal Punty Uncertainty Assay. Target	Funty	Nominal	707			Commonia
	ition	SDS Information		Expanded								-			

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# Certified Reference Material CRM



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

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

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Physical Characterization:

(T)= Target analyte

Certified by:

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

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

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

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

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

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

Part # 57103



M5449 M5450 M5451 M5452 M5453 M5454 Material No.: 9530-33 Batch No.: 22D1462006 Manufactured Date: 2022-02-24 Retest Date: 2027-02-23

Revision No.: 0

# Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Specific Gravity at 60°/60°F	1.185 - 1.192	1.190
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl <sub>2</sub> )	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.5 ppm	< 0.5 ppm
Sulfite (SO3)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH4)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	0.2 ppb
Arsenic and Antimony (as As)	$\leq$ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	1.4 ppb
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	48.0 ppb
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Germanium (Ge)	$\leq$ 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	$\leq$ 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	2 ppb

>>> Continued on page 2 >>>



Material No.: 9530-33 Batch No.: 22D1462006

Test	Specification	Result
Trace Impurities – Lead (Pb)	≤ 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	0.7 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities - Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities - Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Nickel (Ni)	≤ 4.0 ppb	< 0.3 ppb
Trace Impurities - Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	$\leq$ 9.0 ppb	< 2.0 ppb
Trace Impurities - Selenium (Se), For Information Only		< 1.0 ppb
Trace Impurities - Silicon (Si)	≤ 100.0 ppb	< 10.0 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	< 5.0 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	< 0.9 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	0.3 ppb
Trace Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	0.5 ppb
Trace 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.: 22D1462006

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



## Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



#### Certified Reference Material CRM

Solvent: 20510011 Nitric Acid

60.0 (mL) M5468 8



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

**CERTIFIED WEIGHT REPORT:** 

**Part Number:** Lot Number: 58112

120922

Description: Magnesium (Mg)

Nitric Acid

120925 **Expiration Date:** Ambient (20 °C) **Recommended Storage:** 

Nominal Concentration (µg/mL):

10000

**NIST Test Number: 6UTB**  5E-05 Balance Uncertainty

3000.41 Weight shown below was diluted to (mL):

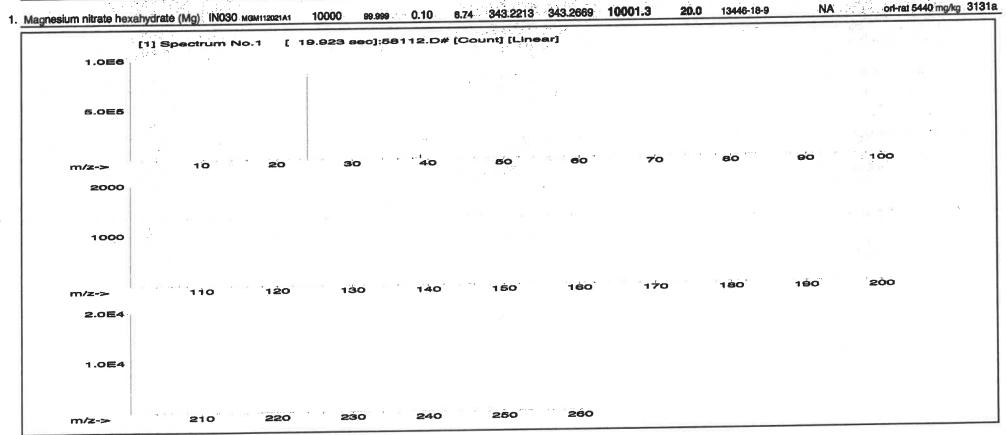
0.058 Flask Uncertainty

Giovanni Esposito Giovanni Esposito 120922 Formulated By: 120922 Pedro L. Rentas Reviewed By:

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

SRM

NIST Uncertainty Actual Actual Target **Uncertainty Assay** Nominal Lot OSHA PEL (TWA) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# Weight (g) (96) Purity (96) . (96) Conc. (µg/mL) Number Compound



Lot # 120922

## Absolute Standards, Inc. 300-368-1131 ww.absolutestandards.com

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

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		MAG THE	Same a		SALISASINE		Name and Address of the			000		CO 0	311	000		200	PU	000	117

Trace Metals Verification by ICP-MS (µg/mL)

OT = Target analyte

Physical Characterization:

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

The first

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 WIST Measurement Result," MIST Technical Mote 1297, U.S. Government Printing Office, Washington, D.C. (1994).



M5483 M5484 M5485 M5486 M5487

Material No.: 9606-03 Batch No.: 22B0862001

Manufactured Date: 2022-01-28

Retest Date: 2027-01-27

Revision No.: 0

# Certificate of Analysis

Test	Specification	Result
Assay (HNO₃)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (CI)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.5 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	2.3 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



Material No.: 9606-03 Batch No.: 22B0862001

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 $\mu m$ and greater	≤ 60 par/ml	4 par/ml
Particle Count - 1.0 μm and greater	≤ 10 par/ml	1 par/ml

Nitric Acid CMOS



Material No.: 9606-03 Batch No.: 22B0862001

Test Specification Result

For Microelectronic Use Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC



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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 f				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	000	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, or other Persons and 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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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
	70.05	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

the preparation of all standards.

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

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.

### **Absolute Standards, Inc.**

800-368-1131 www.absolutestandards.com



#### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20510011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>58029</u> Lot Number: 102622

Description: Copper (Cu)

Expiration Date: 102625

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 6UTB 5E-05 Balance Uncertainty

Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

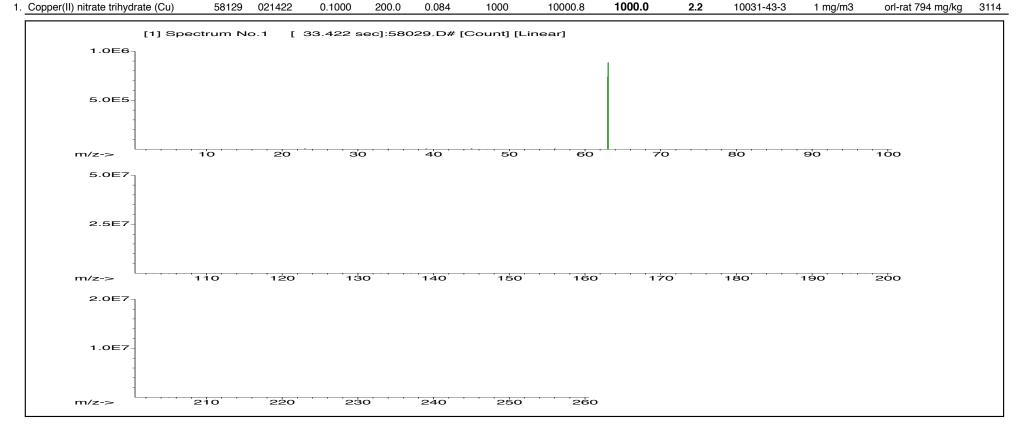
Formulated By: Eli Aliaga 102622

Lacus Denta

Reviewed By: Pedro L. Rentas 102622

**SDS Information** 

Part Lot Dilution Initial Uncertainty Nominal Initial Final Uncertainty (Solvent Safety Info. On Attached pg.) NIST Compound OSHA PEL (TWA) SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL) +/- (μg/mL) CAS# LD50



#### 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):

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	<0.02	Dy	< 0.02	Hf	<0.02	Li	< 0.02	Ni	<0.02	Pr	< 0.02	Se	<0.2	Tb	< 0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	< 0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	< 0.2	Th	< 0.02	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	T	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

**Physical Characterization:** Certified by:

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).

Bur P. All



M5522 M5523 M5524 M5525 M5526 M5527

Material No.: 9606-03 Batch No.: 23B0262006 Manufactured Date: 2023-01-13 Retest Date: 2028-01-12

Revision No.: 0

# Certificate of Analysis

Test	Specification	Result	
Assay (HNO3)	69.0 - 70.0 %	69.7 %	
Appearance	Passes Test	Passes Test	
Color (APHA)	≤ 10	5	
Residue after Ignition	≤ 2 ppm	< 1 ppm	
Chloride (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	< 5.0 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	3.1 ppb	
Trace Impurities – Chromium (Cr)	≤ 30.0 ppb	2.8 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	4.2 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.: 23B0262006

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	13 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	3 par/ml

Nitric Acid CMOS



Material No.: 9606-03 Batch No.: 23B0262006

Specification Result Test

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC



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



M5533 M5534 M5535 M5536 M5537 M5538

Material No.: 9530-33 Batch No.: 22E1662006 Manufactured Date: 2022-04-11 Retest Date: 2027-04-10

Revision No.: 0

# Certificate of Analysis

Test	Specification	Result	
ACS – Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6 %	
ACS – Color (APHA)	≤ 10	5	
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm	
ACS – Specific Gravity at 60°/60°F	1.185 - 1.192	1.190	
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %	
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm	
ACS – Free Chlorine (as Cl <sub>2</sub> )	≤ 0.5 ppm	< 0.5 ppm	
Phosphate (PO4)	≤ 0.05 ppm	< 0.03 ppm	
Sulfate (SO4)	≤ 0.5 ppm	< 0.3 ppm	
Sulfite (SO3)	≤ 0.8 ppm	0.3 ppm	
Ammonium (NH4)	≤ 3 ppm	< 1 ppm	
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm	
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	< 0.2 ppb	
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb	
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb	
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 0.2 ppb	
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities – Boron (B)	≤ 20.0 ppb	< 5.0 ppb	
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb	
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	37.0 ppb	
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb	
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb	
Trace Impurities - Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb	
Trace Impurities - Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb	
Trace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb	
Trace Impurities - Gold (Au)	≤ 4.0 ppb	0.2 ppb	
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb	
Trace Impurities – Iron (Fe)	≤ 15 ppb	1 ppb	

>>> Continued on page 2 >>>



Material No.: 9530-33 Batch No.: 22E1662006

Test	Specification	Result
Trace Impurities - Lead (Pb)	≤ 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Magnesium (Mg)	≤ 10.0 ppb	1.0 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities - Mercury (Hg)	≤ 0.5 ppb	0.1 ppb
Trace Impurities - Molybdenum (Mo)	≤ 10.0 ppb	< 3.0 ppb
Trace Impurities - Nickel (Ni)	≤ 4.0 ppb	< 0.3 ppb
Trace Impurities - Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	$\leq 9.0 \text{ ppb}$	< 2.0 ppb
Trace Impurities - Selenium (Se), For Information Only		1.0 ppb
Trace Impurities - Silicon (Si)	≤ 100.0 ppb	< 0.4 ppb
Trace Impurities - Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	$\leq$ 100.0 ppb	1.9 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	< 0.8 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	< 0.3 ppb
Trace 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.: 22E1662006

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





M5539 M5540 M5541 M5542 M5543 M5544

Material No.: 9606-03 Batch No.: 23B0262006 Manufactured Date: 2023-01-13

Retest Date: 2028-01-12 Revision No.: 0

# Certificate of Analysis

Test	Specification	Result
Assay (HNO3)	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	< 1 ppm
Chloride (Cl)	≤ 0.08 ppm	0.03 ppm
Phosphate (PO4)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities – Aluminum (Al)	≤ 40.0 ppb	< 5.0 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	3.1 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	2.8 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	4.2 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.: 23B0262006

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	13 par/ml
Particle Count - 1.0 µm and greater	≤ 10 par/ml	3 par/ml

Nitric Acid CMOS



Material No.: 9606-03 Batch No.: 23B0262006

Specification Result Test

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC



N5285 NS286 9/7/2022 A.I

# CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

## **CERTIFICATE OF ANALYSIS**

Date: 8/3/2022

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 meq/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

## Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



#### Certified Reference Material CRM

Solvent: 20510011

2%

Lot#

20.0

(mL)

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

Nitric Acid

Nitric Acid

Actual

Actual

**CERTIFIED WEIGHT REPORT:** 

**Part Number:** Lot Number:

56138 082922

Description:

Strontium (Sr)

082925

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

Nominal Concentration (µg/mL):

10000

**NIST Test Number: 6UTB** 

5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 1000.12 0.058 Flask Uncertainty

Nominal

Lot

Formulated By: Lawrence Barry 082922 Reviewed By: Pedro L. Rentas 082922

**SDS** Information **Expanded** (Solvent Safety Info. On Attached pg.) NIST: Uncertainty

Purity Uncertainty Assay Target CAS# **OSHA PEL (TWA)** LD50 SRM. Compound (%) RM# Number Conc. (µg/mL) (96) Purity (%) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL) 1. Strontium nitrate (Sr) IN017 SRZ022018A1 10000 99.997 0.10 24.2756 24.2758 10000.1 20.0 10042-76-9 NA orl-rat >2000mg/kg 3153a 41.2 [1] Spectrum No.1 [ 14.495 sec]:58138.D# [Count] [Linear] 5.0E6 2.5E6 20 90 m/z-> 10 50 80 100 1.0巨6 5.0E5 110 170 m/z->120 130 150 160 180 190 200 5.0E6

210

220

230

240

2.5E6

m/z->

250

260



#### 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):

COM SO	Trace Metals Verification by ICP-MS (µg/mL)																		
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Тъ	<0.02	Ιw	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Ho	< 0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	A2.5.000	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	П	<0.02	v	<0.02
Ba	<0.02	Cs	<0.02	Gđ	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Ве	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	T	Tm	<0.02	Y	<0.02
Bi	<0.02	.Co	<0.02	Ge	<0.02	I.a	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

Certified by:

But All

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.

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

\* 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.

<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.

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

<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).



# 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: WW-LFS-1
Lot Number: S2-MEB710999

Matrix: 5% (v/v) HNO3

Value / Analyte(s): 1 000 μg/mL ea:

Potassium,

600 µg/mL ea: Phosphorus,

300 μg/mL ea:

Sodium, Iron,

200 μg/mL ea:

Magnesium, Aluminum, Cerium, Selenium,

Thallium,

100 μg/mL ea:

Lead, Calcium,

80 μg/mL ea: Arsenic,

70 μg/mL ea: Mercury, 50 μg/mL ea: Nickel,

40 μg/mL ea: Chromium,

 $30~\mu g/mL$  ea:

Copper, Boron,

Vanadium,

20 µg/mL ea:

Zinc, Strontium,
Barium, Beryllium,
Cadmium, Cobalt,
Manganese, Lithium,

7.5 µg/mL ea: Silver

#### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Aluminum, Al	CERTIFIED VALUE 200.0 ± 0.7 μg/mL	ANALYTE Arsenic, As	CERTIFIED VALUE 80.0 ± 0.5 μg/mL
Barium, Ba	20.00 ± 0.09 μg/mL	Beryllium, Be	20.00 ± 0.10 μg/mL
Boron, B	30.00 ± 0.20 μg/mL	Cadmium, Cd	20.00 ± 0.09 μg/mL
Calcium, Ca	100.0 ± 0.4 μg/mL	Cerium, Ce	200.0 ± 0.8 μg/mL
Chromium, Cr	40.00 ± 0.20 μg/mL	Cobalt, Co	20.00 ± 0.09 μg/mL
Copper, Cu	30.00 ± 0.13 μg/mL	Iron, Fe	300.0 ± 1.3 μg/mL
Lead, Pb	100.0 ± 0.5 μg/mL	Lithium, Li	20.00 ± 0.09 μg/mL
Magnesium, Mg	200.0 ± 0.8 μg/mL	Manganese, Mn	20.00 ± 0.09 μg/mL
Mercury, Hg	70.0 ± 0.3 μg/mL	Nickel, Ni	50.00 ± 0.22 μg/mL
Phosphorus, P	600.0 ± 2.7 μg/mL	Potassium, K	1 000 ± 4 μg/mL
Selenium, Se	200.0 ± 1.6 μg/mL	Silver, Ag	7.50 ± 0.05 µg/mL
Sodium, Na	300.0 ± 1.1 μg/mL	Strontium, Sr	20.00 ± 0.09 μg/mL
Thallium, TI	200.0 ± 1.4 μg/mL	Vanadium, V	30.00 ± 0.13 μg/mL
Zina Zn	20 00 + 0 09 ug/ml		

Zinc, Zn  $20.00 \pm 0.09 \mu g/mL$ 

**Density:** 1.037 g/mL (measured at 20  $\pm$  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
As	ICP Assay	3103a	100818
В	ICP Assay	3107	110830
Ва	ICP Assay	3104a	140909
Ва	Calculated		See Sec. 4.2
Ва	Gravimetric		See Sec. 4.2
Ве	ICP Assay	3105a	090514
Ве	Calculated		See Sec. 4.2
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Ca	Calculated		See Sec. 4.2
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Ce	ICP Assay	3110	090504
Ce	EDTA	928	928
Co	ICP Assay	3113	190630
Co	EDTA	928	928
Co	Calculated		See Sec. 4.2
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Cu	Calculated		See Sec. 4.2
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Hg	ICP Assay	3133	061204
Hg	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Calculated		See Sec. 4.2
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Mn	Calculated	0.470	See Sec. 4.2
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Ni -	Calculated		See Sec. 4.2
P	ICP Assay	3139a	060717
Р	Acidimetric	84L	84L

Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	ICP Assay	3149	100901
Sr	EDTA	928	928
Sr	ICP Assay	Traceable to 3153a	K2-SR650985
Sr	Calculated		See Sec. 4.2
TI	ICP Assay	3158	151215
V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928
Zn	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>CRM/RM</sub> , where one method of characterization is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	$X_{CRM/RM} = (X_a) (u_{char\ a})$
X <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	uchar a = the standard uncertainty of characterization Method A
the variance:	
$\mathbf{w_i} = (1/u_{\text{char }i})^2 / (\Sigma (1/(u_{\text{char }i})^2)$	
CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$	CRM/RM Expanded Uncertainty (±) = U <sub>CRM/RM</sub> = k (u <sup>2</sup> <sub>char a</sub> + u <sup>2</sup> <sub>bb</sub> + u <sup>2</sup> <sub>lts</sub> + u <sup>2</sup> <sub>ts</sub> ) <sup>y</sup>
k = coverage factor = 2	k = coverage factor = 2
$\mathbf{u_{char}} = [\Sigma((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method	u <sub>char a</sub> = the errors from characterization
u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty	u <sub>bb</sub> = bottle to bottle homogeneity standard uncertainty
u <sub>lts</sub> = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
u <sub>ts</sub> = transport stability standard uncertainty	uts = transport stability standard uncertainty

#### 4.0 TRACEABILITY TO NIST

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

#### 4.1 Thermometer Calibration

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

#### 4.2 Balance Calibration

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

#### 4.3 Glassware Calibration

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

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

#### 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

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@inorganicventures.com

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

#### 11.1 Certification Issue Date

October 18, 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 18, 2025
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

#### 11.3 Period of Validity

Sealed TCT Bag Open Date:	

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

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

Michael Booth Director, Quality Control Michael 2 Booth

#### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director



## CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030 fax: 540.585.3012 info@inorganicventures.com

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

#### 1.0 ACCREDITATION / REGISTRATION

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



#### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: WW-LFS-2

Lot Number: R2-MEB693161
Matrix: 5% (v/v) HNO3

tr. HF

Value / Analyte(s): 200 µg/mL ea:

Silica,

80 μg/mL ea: Antimony, 70 μg/mL ea:

Tin,

40 μg/mL ea: Molybdenum, 20 μg/mL ea: Titanium

#### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Antimony, Sb  $80.0\pm0.6~\mu\text{g/mL}$  Molybdenum, Mo  $40.00\pm0.17~\mu\text{g/mL}$  Silica, SiO2  $200.0\pm1.5~\mu\text{g/mL}$  Tin, Sn  $70.0\pm0.3~\mu\text{g/mL}$ 

Titanium, Ti 20.00 ± 0.12 μg/mL

**Density:** 1.024 g/mL (measured at 20  $\pm$  4 °C)

#### Assav Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Mo	ICP Assay	3134	130418
Mo	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
SiO2	Calculated		See Sec. 4.2
Sn	ICP Assay	3161a	070330
Ti	ICP Assay	3162a	130925
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 Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where two or more methods of characterization are Certified Value, $X_{CRM/RM}$ , where one method of characterization used is the weighted mean of the results: is used is the mean of individual results: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<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 (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{\frac{1}{2}}$ 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 SRMRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMRM 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 CRWRMs.

### 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 CRMRM is negligible. After opening the sealed TCT bag transpiration of the CRMRM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between  $4^{\circ}$   $24^{\circ}$  C to minimize the effects of transpiration. Use at  $20^{\circ} \pm 4^{\circ}$  C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

#### 8.0 HAZARDOUS INFORMATION

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

#### 9.0 **HOMOGENEITY**

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

#### 10.0 QUALITY STANDARD DOCUMENTATION

#### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

#### 11.1 Certification Issue Date

May 20, 2020

- 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, contaminated, or otherwise modified.

#### 11.2 Lot Expiration Date

- May 20, 2024
- 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

<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 CRWRM 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 Manager, Quality Control

#### **Certifying Officer:**

Paul Gaines

Paul R & ine CEO, Senior Technical Director