

Prep Standard - Chemical Standard Summary

Order ID: 04699

Test: Metals Group 10

Prepbatch ID: PB156486,

Sequence ID/Qc Batch ID: LB129347,

Standard ID:

MP76793,MP76795,MP79167,MP79168,MP79169,MP79171,MP79172,MP79173,MP79174,MP79175,MP79176,MP79177,MP79178,MP79179,MP79180,MP79181,MP79214,

Chemical ID:

M4589, M4825, M4874, M4876, M4877, M4880, M4881, M4882, M4883, M4884, M4885, M4886, M4888, M4889, M4891, M4901, M4939, M5019, M5020, M5100, M5129, M5184, M5192, M5200, M5218, M5222, M5224, M5226, M5227, M5228, M5288, M5284, M5294, M5298, M5387, M5394, M5429, M5467, M5496, M5498, M5513, M5521, M5616, M5626, M5643, M5649, M5658, M5748, M5762, M5768, M5772, M5786, W2606,

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Metals STANDARD PREPARATION LOG

ID NAME NO. Prep Date Date By Sca 169 1:1HNO3 MP76793 08/16/2023 02/03/2024 Al-Terek Isaac METAL LE_2 ((M SC-2) ETTE	ΓΤΕ_1 (ICP	Sarabjit Jaswal 08/16/2023
FROM 1250.00000ml of M5626 + 1250.00000ml of W2606 = Final Quantity: 2500.000 ml		A)	00/10/2020

Recipe				Expiration	<u>Prepared</u>			Supervised By	
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal	
170	1:1HCL	MP76795	08/16/2023	01/18/2024	Al-Terek Isaac	METALS_SCA	METALS_PIP	,	
						LE_2 (M SC-2)	ETTE_1 (ICP	08/16/2023	
	A)								

FROM 1250.00000ml of M5616 + 1250.00000ml of W2606 = 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. MP79167	Prep Date 01/29/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/30/2024
FROM	125.00000ml of M5762 + 2350.00000	Oml of W260	06 + 25.00000	ml of M5772 =	Final Quantity:	2500.000 ml		

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
903	ICP AES RINSE SOLN	MP79168	01/30/2024	02/11/2024	Bin He	None	METALS_PIP ETTE_3 (A)	,

FROM 200.0000ml of M5772 + 9800.0000ml of W2606 = Final Quantity: 10000.000 ml

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Metals STANDARD PREPARATION LOG

	Recipe ID 912	NAME ICP AES ICV SOLN	NO. MP79169	Prep Date 01/30/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/30/2024
ľ	FROM 0.02500ml of M5019 + 0.02500ml of M5020 + 0.02500ml of M5429 + 0.25000ml of M5218 + 0.25000ml of M5228 +								

 $0.02500 ml \ of \ M5019 + 0.02500 ml \ of \ M5020 + 0.02500 ml \ of \ M5429 + 0.2500 ml \ of \ M5218 + 0.2500 ml \ of \ M5228 + 0.2500 ml \ of \ M5218 + 0.2500 ml \ of \ M5228 + 0.2500 ml \ of \$ 10.00000ml of M5294 + 89.77500ml of MP79167 = Final Quantity: 100.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u> 904	NAME ICP AES ICSA SOLN	NO. MP79171	Prep Date 01/29/2024	<u>Date</u> 02/11/2024	<u>By</u> Bin He	<u>ScaleID</u> None	PipetteID METALS PIP	Sarabjit Jaswal
							ETTE_3 (A)	01/30/2024

10.00000ml of M5129 + 90.00000ml of MP79167 = Final Quantity: 100.000 ml **FROM**

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Metals STANDARD PREPARATION LOG

Recipe ID 3494	NAME ICP AES ICSAB SOLN-1	NO. MP79172	Prep Date 01/29/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP	Supervised By Sarabjit Jaswal
							ETTE_3 (A)	01/30/2024
FROM 0.10000ml of M4589 + 0.10000ml of M4880 + 0.10000ml of M4882 + 0.10000ml of M4939 + 0.10000ml of M5228 +								

0.10000ml of M4589 + 0.10000ml of M4880 + 0.10000ml of M4882 + 0.10000ml of M4939 + 0.10000ml of M5228 + 0.10000ml of M4589 + 0.10000ml of M5228 + 0.100000ml of M5228 10.00000ml of M5129 + 10.00000ml of M5222 + 79.50000ml of MP79167 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
907	ICP AES STD S (S5)		01/29/2024	02/11/2024	Bin He	None	METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/30/2024

FROM 460.0000ml of M4939 + 5.0000ml of M4589 + 5.0000ml of M4880 + 5.0000ml of M4882 + 5.0000ml of M5100 + 5.00000ml of M5224 + 5.00000ml of M5228 + 5.00000ml of M5394 + 5.00000ml of MP79167 = Final Quantity: 500.000 ml

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Metals STANDARD PREPARATION LOG

Recipe <u>ID</u> 910	NAME ICP AES STD S4	NO. MP79174	Prep Date 01/29/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_3 (A)	
FROM	100.00000ml of MP79167 + 100.000	00ml of MP	79173 = Fina	l Quantity: 200.	000 ml			

Recipe				Expiration	<u>Prepared</u>		-	Supervised By
<u>ID</u> 909	NAME ICP AES STD S3	NO. MP79175	Prep Date 01/29/2024	<u>Date</u> 02/11/2024	<u>By</u> Bin He	<u>ScaleID</u> None	PipetteID METALS PIP	Sarabjit Jaswal
							ETTE_3 (A)	01/30/2024

FROM 150.00000ml of MP79167 + 50.00000ml of MP79173 = Final Quantity: 200.000 ml

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Metals STANDARD PREPARATION LOG

Recipe <u>ID</u> 3913	NAME ICP AES STD S2	NO. MP79176	Prep Date 01/29/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/30/2024
FROM	16.00000ml of MP79173 + 184.0000	0ml of MP79	9167 = Final	Quantity: 200.0	00 ml			

Recip	2			Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
911	ICP AES CCV SOLN	MP79177	01/29/2024	02/11/2024	Bin He	None	METALS_PIP ETTE_3 (A)	
							_ ` '	0 :: 00: 202 :

FROM 100.00000ml of MP79167 + 100.00000ml of MP79173 = Final Quantity: 200.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
3651	LR CHECK 1	<u>MP79178</u>	01/29/2024	02/11/2024	Bin He	None	METALS_PIP ETTE_3 (A)	,
FROM	10.00000ml of M5288 + 18.00000ml			of M5498 + 18.0	0000ml of M57	68 + 20.00000r	ml of M5289 +	

9.00000ml of M5298 + 7	00000ml of MP79167	= 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
3652	LR CHECK2		01/29/2024	02/11/2024	Bin He	None	METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/30/2024

FROM 10.00000ml of M5387 + 2.50000ml of M5513 + 25.0000ml of M5226 + 3.50000ml of M4891 + 4.50000ml of M5184 + 5.0000ml of M5748 + 54.50000ml of MP79167 = Final Quantity: 100.000 ml

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Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared		-	Supervised By
<u>ID</u> 2950	NAME ICP AES S1/CRI STOCK STD	NO. MP79180	Prep Date 01/26/2024	<u>Date</u> 02/08/2024	<u>By</u> Bin He	<u>ScaleID</u> None	PipetteID METALS PIP	Sarabjit Jaswal
2000	TOT NEW OTHER OTHER OTHER	<u> </u>	01/20/2024	02/00/2024	Biii i i i	140110	ETTE_3 (A)	01/30/2024

FROM

0.03000 ml of M4876 + 0.03000 ml of M4877 + 0.05000 ml of M4885 + 0.05000 ml of M5298 + 0.05000 ml of M5496 + 0.05000 ml of M5496 + 0.05000 ml of M5658 + 0.06000 ml of M4881 + 0.10000 ml of M4874 + 0.10000 ml of M4880 + 0.10000 ml of M4883 + 0.10000 ml of M4883 + 0.10000 ml of M4886 + 0.20000 ml of M4886 + 0.20000 ml of M4886 + 0.20000 ml of M4889 + 0.20000 ml of M4889 + 0.20000 ml of M4891 + 0.20000 ml of M5227 + 0.20000 ml of M5748 + 0.25000 ml of M5224 + 0.25000 ml of M5467 + 0.50000 ml of M4901 + 0.50000 ml of M5387 + 1.00000 ml of M5192 + 1.00000 ml of M5498 + 1.00000 ml of M5768 + 2.00000 ml of M4882 + 2.00000 ml of M4884 + 87.13000 ml of M79167 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By
2951			01/26/2024	02/08/2024	Bin He		METALS PIP	Sarabjit Jaswal
							ETTE_3 (A)	01/30/2024

FROM 196.00000ml of MP79167 + 4.00000ml of MP79180 = Final Quantity: 200.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	NO. MP79214	Prep Date 01/29/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/31/2024
FROM	125.00000ml of M5762 + 2350.00000	Oml of W260	06 + 25.00000	oml of M5786 =	Final Quantity:	2500.000 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.	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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Arsenic (As)	012521	02/25/2024	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.	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 / Received By	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 /	Chemtech Lot #



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 Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	073021	07/30/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4889
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	031921	03/19/2024	08/25/2021 / bin	08/05/2021 / jaswal	M4891
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 /	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 #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	011421	02/29/2024	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 #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	04/28/2024	10/28/2023 /	04/20/2021 / bin	M5129
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	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.	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 #
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	04/28/2024	10/28/2023 /	04/20/2021 / bin	M5222
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	101521	10/15/2024	06/29/2022 / bin	10/18/2021 / bin	M5224
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 /	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 #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	073021	07/30/2024	11/27/2022 / jaswal	07/05/2022 / bin	M5228



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	071122	07/11/2025	09/01/2022 / jaswal	07/21/2022 / jaswal	M5288
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Aluminum (AI) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	01/01/2025	12/13/2023 / bin	02/20/2020 / bin	M5294
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	020422	02/04/2025	05/02/2023 / jaswal	06/15/2022 / jaswal	M5298
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	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 /	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB714159	01/13/2027	11/28/2022 / bin	09/19/2022 / bin	M5394



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	, , , , , , , , , , , , , , , , , , , ,		07/06/2025	01/30/2023 / bin	01/26/2023 / bin	M5429
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57058 / Cerium, 1000PPM, 100ML	020623	02/06/2026	03/06/2023 / bin	03/01/2023 / bin	M5467
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	, , , , , , , , , , , , , , , , , , , ,		01/16/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5496
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5498
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	061522	06/15/2025	03/19/2023 / bin	03/17/2023 / bin	M5513
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute 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 / Received By	Chemtech Lot #	
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)		01/18/2024	07/26/2023 / mohan	04/11/2022 / Al-Terek	M5616	
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)		02/03/2024	08/08/2023 / Al-Terek	01/13/2023 / Al-Terek	M5626	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Inorganic Ventures	-		08/17/2024	08/18/2023 / bin	04/16/2023 / bin	M5643	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #	
Inorganic Ventures	· · · · · · · · · · · · · · · · · · ·		02/17/2027	12/11/2023 /	04/16/2023 /	M5649	
ventures	Fortified Stock Solution 2,		02,11,2021	bin	bin	IVI3049	
Supplier	Fortified Stock Solution 2,	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #	
	Fortified Stock Solution 2, 125 ml	Lot # 060523	Expiration	Date Opened /	Received Date /	Chemtech	
Supplier Absolute	Fortified Stock Solution 2, 125 ml ItemCode / ItemName 58024 / Chromium, Cr, 500		Expiration Date	Date Opened / Opened By 08/28/2023 / jaswal	Received Date / Received By	Chemtech Lot #	



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)		0000281827	03/29/2026	12/29/2023 /	12/01/2023 / Al-Terek	M5762
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	100.11= 19, 100.00 1,		09/18/2026	01/08/2024 / bin	01/03/2024 / bin M5768	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	Seidler Chemical BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)		07/05/2024	01/18/2024 / jaswal	06/26/2023 / Al-Terek M5772	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	23G1262003	07/30/2024	01/30/2024 / Al-Terek	06/26/2023 / Al-Terek	M5786
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical DIW / DI Water Da		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 ± 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_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u_{char a} = 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_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; 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_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u_{char a} = 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_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

 Sealed TCT Bag C 	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 μ 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_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u_{char a} = 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_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

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

 Sealed TCT Bag Open Date: 	
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- 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

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

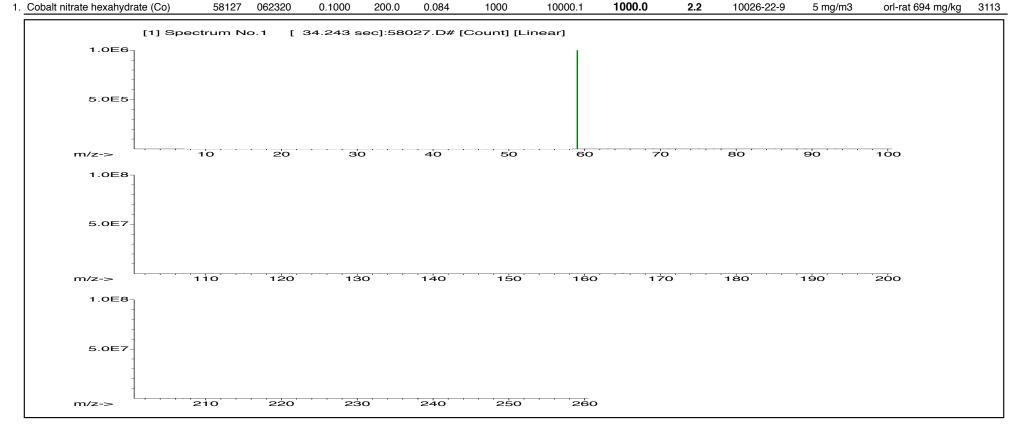
SDS Information

(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.
- * 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).

Bu P. Sha

Absolute Standards, Inc.

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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

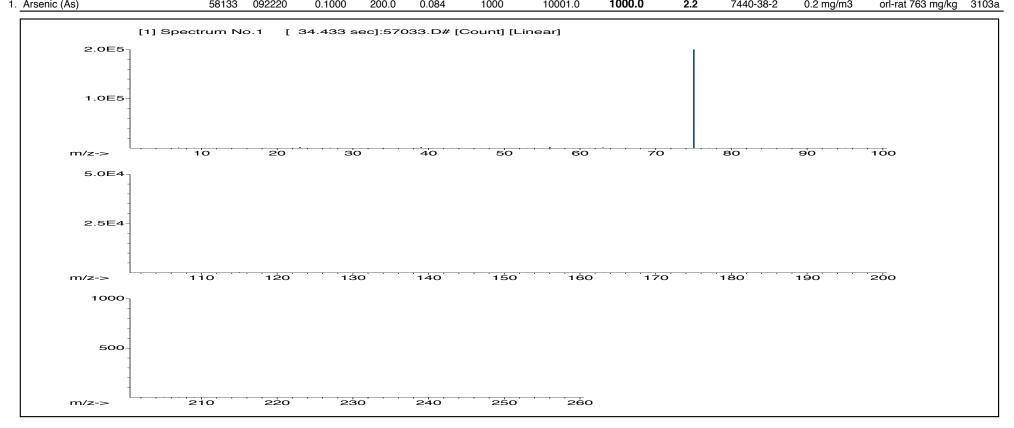
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

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	0.2ma/m^2	orl rat 762 ma/ka	21022



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	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.
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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).

Certified by:

Bu 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

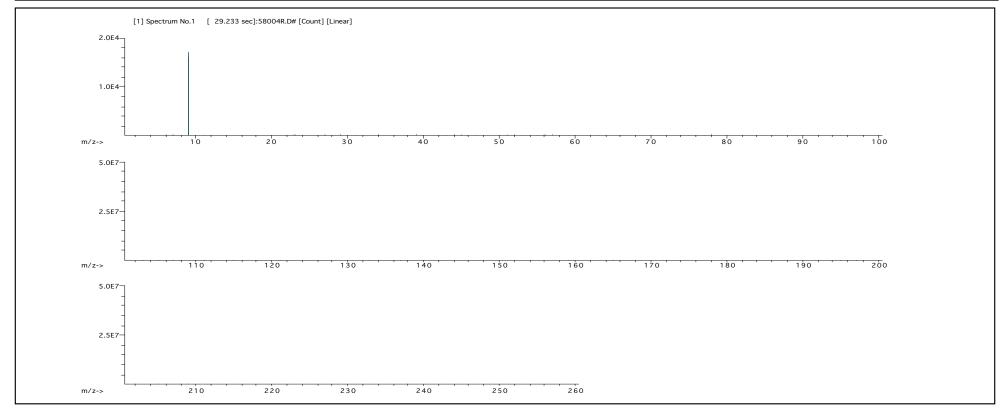
Reviewed By: Pedro L. Rentas 030221

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



Certified Reference Material CRM



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 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	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.
- * 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 # 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

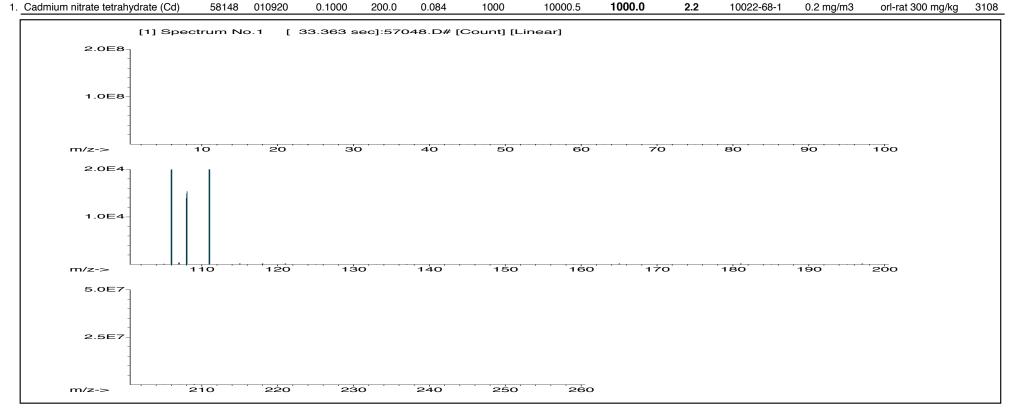
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

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. (μ g/mL) Conc. (μ g/mL) Conc. (μ 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

^{*} 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%



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

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

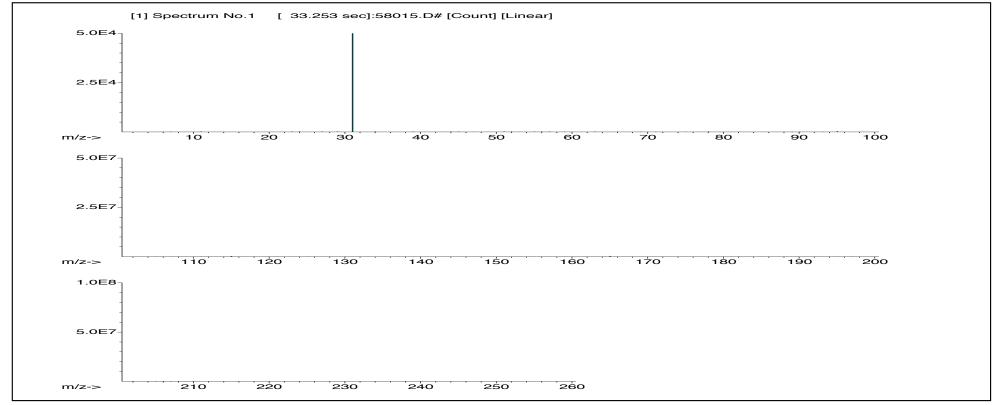
Reviewed By: Pedro L. Rentas 051121

SDS Information

(Solvent Safety Info. On Attached pg.)

Compound Number OSHA PEL (TWA) SRM Factor Vol. (mL) Pipette (mL) Conc. (μ g/mL) Conc. (μ g/mL) Conc. (μ 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.

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- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
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- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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%



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

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. (μ g/mL) Conc. (μ g/mL) Conc. (μ 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.

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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).

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		ദ ്ഠ	90	100	
	5.0E7												
	m/z->	110	120	130	140	150	160	17	0	180	190	200	

250

260

240



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	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.
- * 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).

Bu f. All

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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:
 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

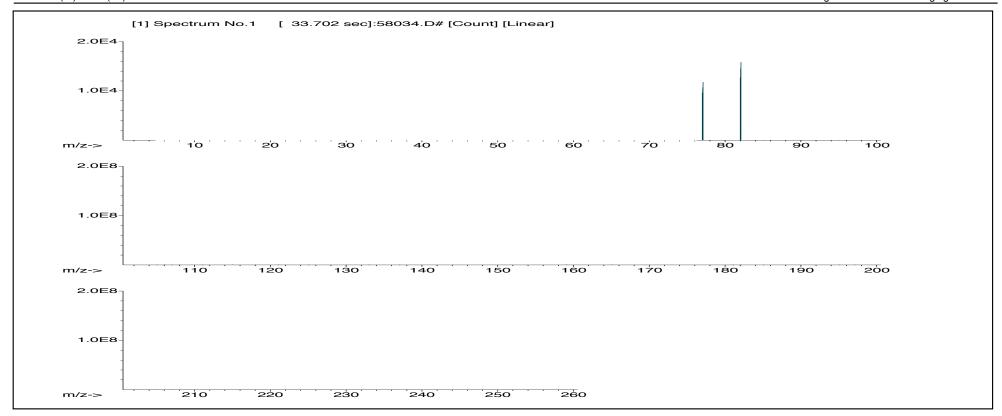
Formulated By: Giovanni Esposito 070221

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
 Selenium(IV) oxide (Se) 	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





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

Sn P. Shi

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	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

^{*} 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

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)

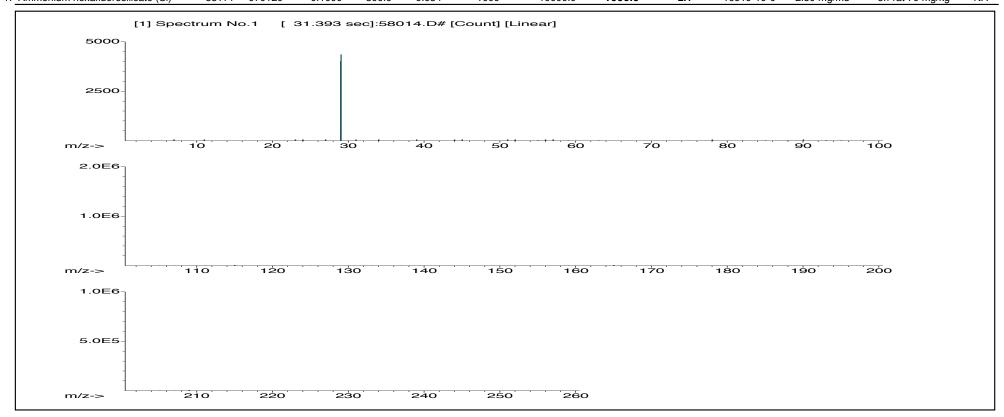
Nominal Concentration (µg/mL): 1000

> **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





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

Bu K. 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	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%



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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):

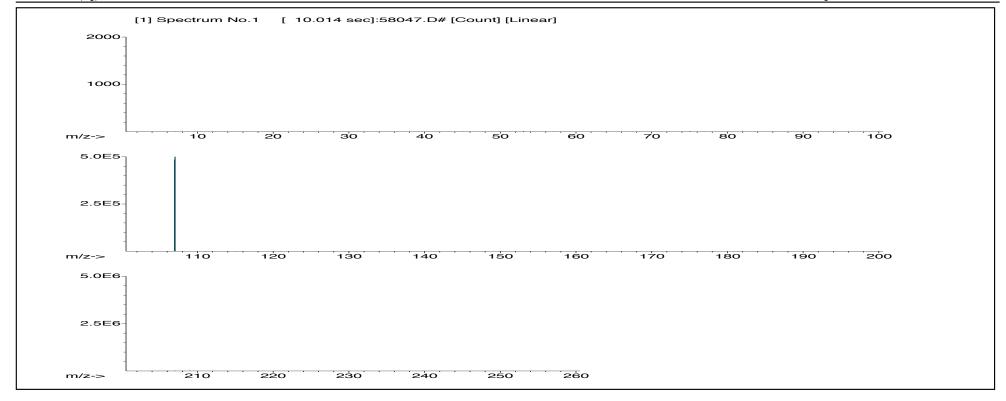
> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

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

^{*} 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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Part

Certified Reference Material CRM



Expanded

SDS Information

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NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent: Part Number: 57050 19410105 Nitric Acid 021121 Lot Number: 240241 Hydrochloric acid

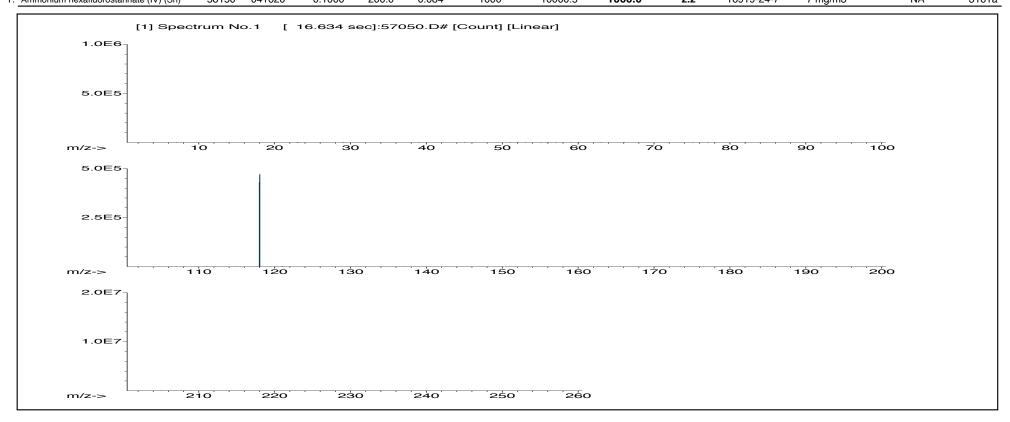
Description: Tin (Sn) 2.0% 40.0 Nitric Acid Formulated By: Lawrence Barry 021121 **Expiration Date:** 021124 6.0% 120.0 Hydrochloric acid **Recommended Storage:** Ambient (20 °C) (mL) 1000 Nominal Concentration (µg/mL): **NIST Test Number:** 23060 5E-05 Balance Uncertainty Reviewed By 021121 Pedro L. Rentas Volume shown below was diluted to (mL): 1999.78 0.265 Flask Uncertainty

Dilution Initial (Solvent Safety Info. On Attached pg.) Lot Uncertainty Uncertainty Compound OSHA PEL (TWA) SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. (μ g/mL) Conc. (μ g/mL) Conc. (μ g/mL) +/- (μg/mL) CAS# LD50 1000.0 1. Ammonium hexafluorostannate (IV) (Sn) 58150 041620 0.1000 200.0 0.084 1000 10000.5 2.2 16919-24-7 7 mg/m3 NA 3161a

Initial

Final

Nominal





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	Се	< 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

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57022

 Lot Number:
 070721

Description: <u>Titanium (Ti)</u>

Expiration Date: 070724

Part

Recommended Storage: Ambient (20 °C)

Nominal Concentration (μ g/mL): 1000

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

Dilution

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

Lot

Formulated By: Lawrence Barry 070721

Lawrence Barry 070721

Reviewed By: Pedro L. Rentas 070721

SDS Information

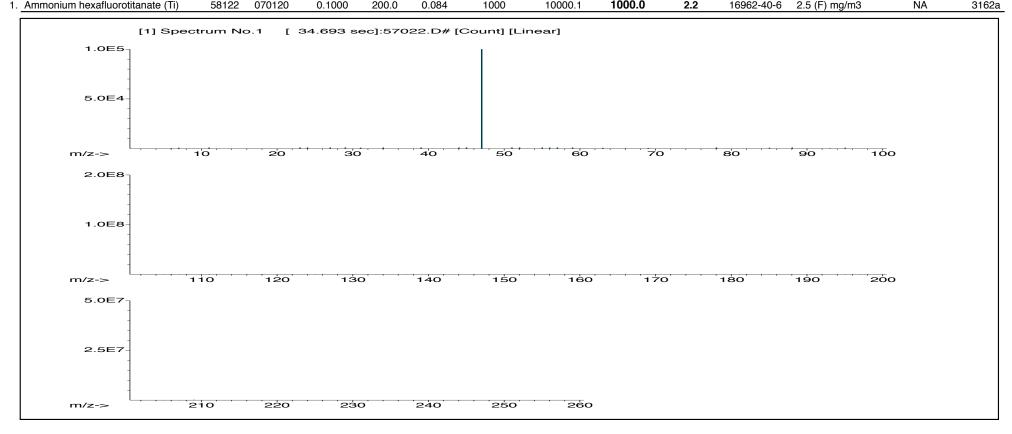
(Solvent Safety Info. On Attached pg.)

Compound CAS# OSHA PEL (TWA) LD50 SRM Number Number Factor Vol. (mL) Pipette Conc. (µg/mL) Conc. (μ g/mL) Conc. (μ g/mL) +/- (µg/mL) 1000.0 16962-40-6 1. Ammonium hexafluorotitanate (Ti) 070120 0.1000 200.0 0.084 1000 10000.1 2.2 2.5 (F) mg/m3 NA 3162a

Nominal

Uncertainty

Initial





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. (μ g/mL) Conc. (μ 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

^{*} 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).

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

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

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

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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

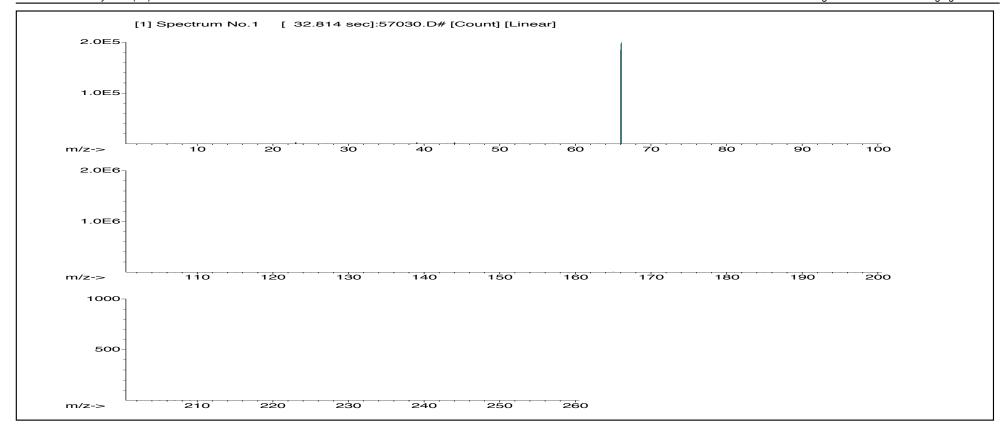
Reviewed By: Pedro L. Rentas 031921

SDS Information

(Solvent Safety Info. On Attached pg.)

Compound OSHA PEL (TWA) SRM Number Number Factor Vol. (mL) Pipette (mL) Conc. (μ g/mL) Conc. (μ g/mL) Conc. (μ 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.

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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



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

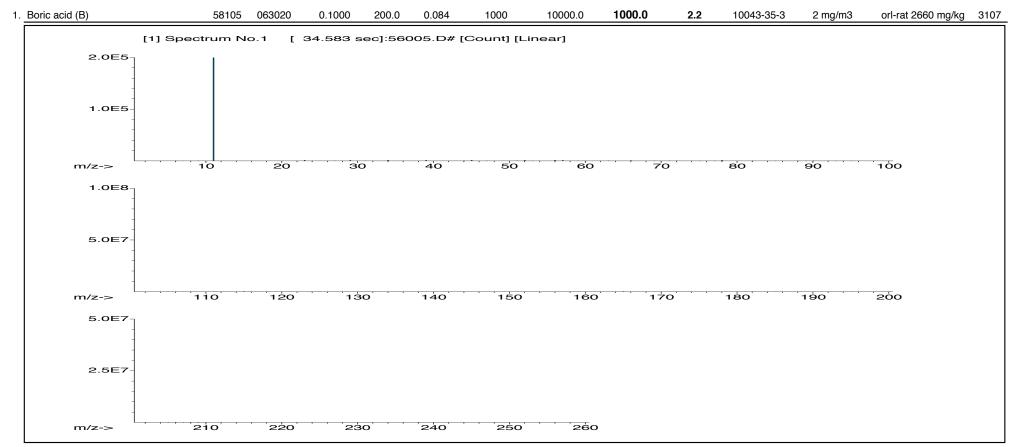
Formulated By: Giovanni Esposito 031921

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. (μ g/mL) Conc. (μ g/mL) Conc. (μ 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

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

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m/z-> 210	5.0E7	1.0E8 5.0E7	2.0E5	1. Lithium nitrate (Li)	Volume shown below was diluted to (mL): Part Lot Compound Number Number	Recommended Storage: Nominal Concentration (ug/mL): NIST Test Number:	Part Number: Lot Number: Description:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
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)	winty	19410105 2.0%	eference
260		160	60		Initial Conc. (µg/mL) C	3	光 5	Certified Reference Material CRM $\mathbb{N}4^9$
				1000.0	Final Conc. (µg/mL)		Nitric Acid	Mc
		170	76		11	Reviewed By:	Formulated	P893
		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/V
		200	100	ori-rat	ation Attached pg.) LD50	030221	030221	(B) https://absolutestandards.com
					NIST			occredited Number lards.com



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

B B AS							
4 0.02							140
5 5 5	-	<u>ک</u>	<u>چ</u>	2	8		
A 0.02	<0.02		<0.02	40.2	<0.02		
5 E	2		Eu	T.	Dy		
40.02	20.02	2	<0.02	<0.02	40.02		
िस म	F		7	Но	Hf		
	40.2	<0.02	<0.02	<0.02	<0.02		Trace Mo
Mo	Нд	Mn	Mg	Ŀ	Ľ		letals
20.02	402	<0.02	10.0>	<0.02	Т		Verifica
7 7	р -р	Pd	S _O	¥	Z.		tion I
A.0.2	A 0.02	<0.02	40.02	<0.02	<0.02		by ICP-M
Sm	S R	Rb	Rh	Re	Pr		in) S
40.02	40.02	<0.02	<0.02	<0.02	<0.02		g/mL)
- J	s Sr	Na	Ag	Si	Se		
A).02	40.02	40.2	<0.02	40.02	<0.2		
H K	S II	규	Ħ	Te	4T	STREET, STREET	
A) (2)	A.02	<0.02	<0.02	<0.02	<0.02		
72	7 ~	4,	<	c	W		
A 0.02	A0.02	40.02	<0.02	40.02	40.02		

(T)= Target analyte

Physical Characterization:

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

Certified by:

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



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	Ho	• <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 _a	<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	රි	<0.02	g	<0.02	Ľ	<0.02	Mo	<0.02	표	<0.02	Sm	<0.02	S	Н	Sn	<0.02	Zn	<0.02
В	<0.02	♂	<0.02	Αn	<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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Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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

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

	1. Ammonium dihydrogen phosphate (P)			Compound		
	IN008 PV052018A1		Melle	RM#		
	V052018A1		1	Nimber	בסר	2
	10000		Conc. (July 1111)	Cone (we/m!)	Dillion	Nominal
	99.999		(90)	(2)	Purity	
	0.10		Punty (%)	2	Uncertainty Assay	
	27.3		(%)		ASSay	•
	109.9063		Weight (g)		larget	•
-	109.9093		Weight (g)		Actual	
	10000.3) Conc. (ug/mL) +/- (ug/ml) CAS#		Actual	
	20.0	() () () () () ()	+/- (ua/ml)	farmer or and	Uncertainty	exhanged
	20.0 7722-76-1	0,101	CAS#	1001	(5)	
	5 ma/m3	(441)	OSHA DEL (TWA)	(Solvent Salety Hills, Oll Attached bg.)	ant Safaty Info On Atta	SUS INFORMATION
LANI	NA A	רביטט	DEO	acried bg.)	ached on	3

m/z->	, 2500	m/z->	500	m/z->	2.564	5.0E4
				•		[1] Spe
210		110		0		[1] Spectrum No.1
220		120		N _O		
8		ā		30		12.074
230		130				sec]:581
240		140		6		15.D#[C
250		150		50		[12.074 sec]:58115.D# [Count] [Linear]
260		160		80		nearj
U						
		170		70		
		180		80		
		190		90		
		200				
		000		100		



		В	B:	Be	Ва	1 3	2	Sb	2		
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		_	_								
		υ	င္ပ	Ω	S	3	2 6	<u>ڻ</u>	S		
		<0.02	40.02	<0.02	<0.02	<0.02	200	3	<0.02		
		Au	Ge	Ga	DQ.	Eu	1	ų į	Dγ		
		∆ 0.02	40.02	40.02	<0.02	<0.02	20.02	3 6	A)A		
		Р	<u></u>	ਸ਼ ਜ	r,	In	HO	: :	HF		
	1000	A) 03	40.02	A) 2	40.02	<0.02	<0.02	20.02	20.03	11900	1
		Z :	Mo de	H ₀	M	Mg	Lu			INCLU	Note
	ŀ								1	V V V	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
(T)= Target analyte	20.07	000	3 6	3	0.02	20.01	0.02	20.02	2		
rget an	7	۲ ;	ģ -	o ;	P	၀ွ	N _p	2			
alyte	7.03	20.02	3 -	10:00	400	40.02	<0.02	40.02		by ICP-I	
	Sc	mc	? 2	2 8	5	Rh	Re	7		D F	5
	40.02	40.02	40.02	\$0.02	3 8	8	A).02	<0.02		/g/mL)	
	Ta	· v.	y,	. 2	3.6	Ag	S:	Se			
	<0.02	40.02	<0.02	8	20.02	3	A) (2)	402			
	Ti	Sn	Tm	-	1 =	= ;	,	7			
	<0.02	<0.02	40.02	<0.02	20.02	9 9	A 89	<0.02	PARTICIPATION STREET		
	Zr	Zn	×	4,4	<	; (=	W			
	<0.02	<0.02	<0.02	<0.02	20.02	2002	3	40.02			

Physical Characterization:

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

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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 HNO₃. Analyze this ICSA solution by ICP-AES.

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

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

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

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
Ва	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

www.absolutestandards.com



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

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(T)= Target analyte

Physical Characterization:

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

Certified by:



- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the balances that are calibrated with weights traceable to NIST (see above).

- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
 * All standards should be stored with caps tight and under appropriate laboratory conditions.
 * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).





Part # 58025

Absolute Standards, Inc. 800-368-1131

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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:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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Certified Reference Material CRM

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

kg 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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Part # 58111



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:

(1)= Target analyte

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

Certified by:

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

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

^{*} All standard containers are meticulously cleaned prior to use.

^{*} Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIŞT (see above).

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

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

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

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



Certificate of Analysis

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_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM}$ = k ($u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$)^{1/2} CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u_{char a} = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT **HF Note:** This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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This CDM/DM should not be up	and langer than one year for six	months in the case of a 2	n ml

- I his 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 Laine





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 HNO₃. Analyze this ICSA solution by ICP-AES.

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

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

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

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
Ва	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)

Nitric Acid

Expanded

20370011

2.0%



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CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>57051</u> Lot Number: 101521

Description: Antimony (Sb)

Expiration Date: 101524

Recommended Storage: Ambient (20 °C)

Nominal Concentration (μg/mL): 1000

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

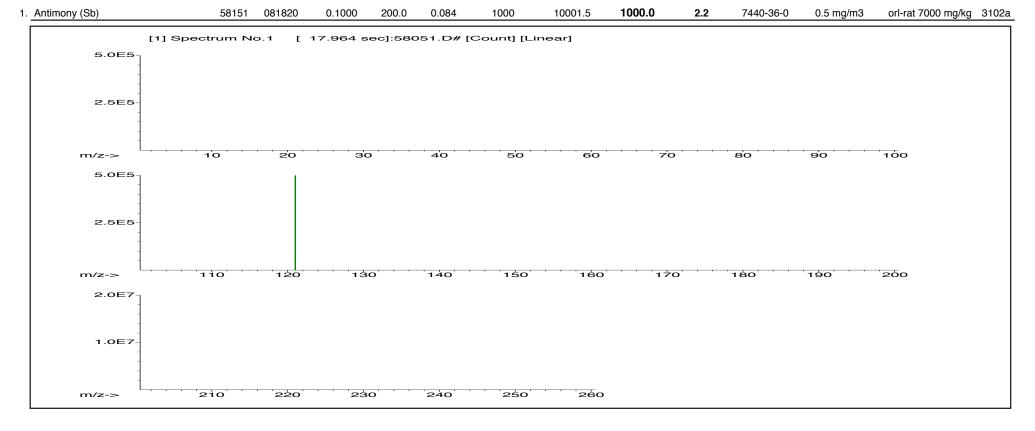
Volume shown below was diluted to (mL): 2000.25 0.116 Flask Uncertainty

Formulated By: Giovanni Esposito 101521

Licks Reviewed By: Pedro L. Rentas 101521

SDS Information

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





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But 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	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.

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

^{*} 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).

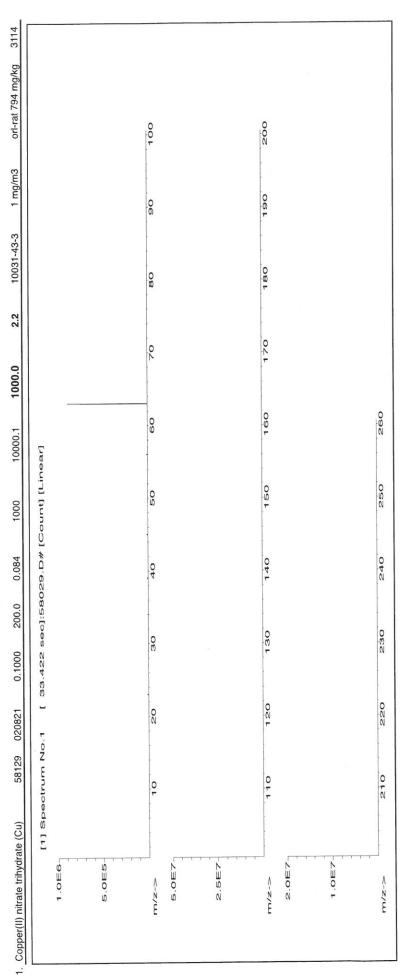
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W52仏 Certified Reference Material CRM

B

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

CERTIFIED WEIGHT REPORT:						# 10T	Solvent:						ſ
Part Number: Lot Number:		58029 022822				20370011	Nitric Acid		Livannie	ž.	aposto		
Description:		Copper (Cu)	~					!	7				_
						2.0%	40.0	Nitric Acid F	Formulated By:		Giovanni Esposito	022822	ΛΙΙ
Expiration Date:		022825					(mL)		1		(
Recommended Storage:		Ambient (20 °C)	()						1	M	on the		
Nominal Concentration (µg/mL):		1000							June				_
NIST Test Number:		6UTB		5E-05	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	022822	ন
Volume shown below was diluted to (mL):	was diluted t	o (mL):	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.)	hed pg.)	NIST
Compound	Number Number	umber	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Vol. (mL) Pipette (mL) Conc. (μ g/mL) Conc. (μ g/mL) Conc. (μ g/mL) +/- (μ g/mL)		CAS#	OSHA PEL (TWA)	LD50	SRM





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

											2	5	3,						
Αl	<0.02	CA	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Z.	<0.02	Pr	<0.02	Se	<0.2	ď	<0.02	¥	<0.02
Sb	<0.02	Ca	<0.2	Er	< 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	O _s	< 0.02	Rh	< 0.02	Ago	<0.02	1	<0.02	<	<0.02
Ba	<0.02	Cs	< 0.02	Gd	<0.02	Ιr	<0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	<0.2	Τh	<0.02	ΥЬ	<0.02
Ве	<0.01	Ç	< 0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	Tm	<0.02	Υ	<0.02
B:	<0.02	Со	< 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	Рь	<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:

- * 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).

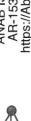
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		200	Giovanni Esposito	O K	Pedro L. Rentas		SDS Information Safety Info. On Attac	OSHA PEL (TWA)	1.0 mg/m3			0				00				
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										3 8 6 0		30				130				230
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1	S								-											

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

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							I race M	letals	Verifica	tion	by ICP-N	IS (E	g/mL)						
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As	<0.2	ပိ	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	E	<0.02	>	F
Ва	<0.02	Cs	<0.02	PS	<0.02	1	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Ϋ́	CO 0>
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Bi	<0.02	ပိ	<0.02	Ge	<0.02	La	<0.02	Мо	<0.02	Ł	<0.02	Sm	<0.02	S	<0.02	Sn	<0.00	, Z	20:07
В	<0.02	Cn	<0.02	Αn	<0.02	Pb	<0.02	PN	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	Ţ	<0.02	7.	<0.0>
						No. of Concession, Name of Street, or other Persons and Street, or other P	The second secon										-	į	70.00

(T)= Target analyte

Certified by:

Physical Characterization:

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



^{*} All standard containers are meticulously cleaned prior to use.

Printed: 11/18/2021, 11:15:07 PM

^{*} 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 20/65



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CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: Lot Number: Description: 57038 073021 Strontium (Sr) **BTU9** 1000 Ambient (20 °C) 073024 3000.41 5E-05 0.058 Flask Uncertainty Balance Uncertainty 20370011 Lot # 2.0% Nitric Acid Solvent: 60.0 Nitric Acid Formulated By: Reviewed By: Expanded Gievannie areas 2 Giovanni Esposito Pedro L. Rentas **SDS Information** 073021 073021

31	orl-rat 2750mg/kg 3153a	NA	10042-76-9	2.1	1000.0	10000.1	1000	0.084	300.0	0.1000	062321	58138	Strontium nitrate (Sr)
SRIV	LD50	OSHA PEL (TWA)	CAS#	+/- (µg/mL)	Conc. (µg/mL) +/- (µg/mL)	Conc. (µg/mL)	Vol. (mL) Pipette (mL) Conc. (µg/mL)	Pipette (mL)	Vol. (mL)	Factor	Number	Number	Compound
TSIN	ttached pg.)	(Solvent Safety Info. On Attached pg.	(Solv	Uncertainty	Final	Initial	Nominal	Uncertainty	Initial	Dilution	Lot	Part	

	S.OE7	m/z-> 1 1.0E8	5.0E7	1.0E8	1.0E6	2.0E6
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N .		150		SO		[33.272 sec]:57038.D# [Count] [Linear]
, ,		160		6)		t] [Linear]
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		180		80		
		190		90		
		200		100		



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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	<0.02	<0.02	0.02	4000	<0.02	<0.02	3	40.02	20.02	200				

(I)= larget analyte

Physical Characterization:

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

Certified by:

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

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

3

Certified Reference Material CRM

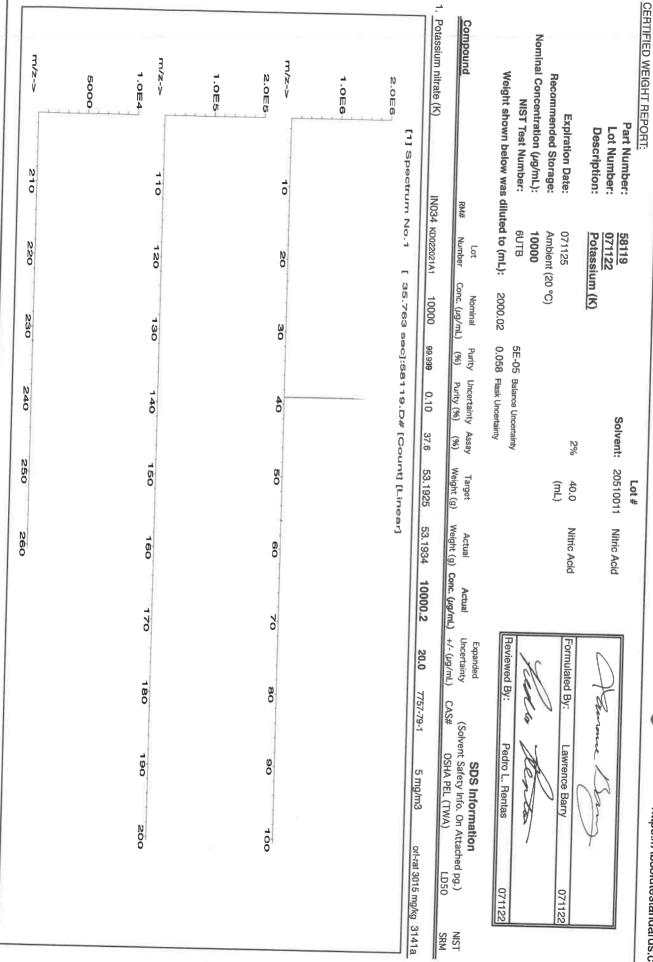
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https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

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

Physical Characterization:	Al <0.02 Cd <0.02 Dy Sb <0.02 Ca <0.02 En As <0.02 Ca <0.02 En Ba <0.02 Ca <0.02 En Ba <0.02 Ca <0.02 Gd Bi <0.02 Ca <0.02 Ga Bi <0.02 Ca <0.02 Ga	
23 10,002 43	<0.02 Hf <0.02 Li <0.02 Ni <0.02 Pr <0.02 Se <0.2 Tb <0.02 W <0.02 <0.02	Trace Metals Verification by ICP-MS (µg/mL)

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

Certified by:

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

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

Se <0.2	Tb <0.
	Ti <0.02
Se Se Si Na Sr Sr Sr	40.02 40.02 40.02 40.02 40.02

Physical Characterization:

(I)= larger analyte

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

Certified by:

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2 of 2



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

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

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

the analyses.

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

> Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

ICV1-1014

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

Page 1 of 2



RMs ICV 1, 5, 6 SFAM.docx



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

ICV1-1014

For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.

ICV5-0415

For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K₂Cr₂O₇ and 5% (v/v) nitric acid.

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K₃Fe(CN)₆, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

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

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		INI INI	NIST	g 3126a		
		020422	ned pg.) LD50	orl-rat 7500mg/kg		
	13	2 /4	nation On Attac (A)	ō	100	
	The state of the s	Giovanni Esposito	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LDSG	5 mg/m3		
	W	Giovar	SI Nent Sal OSH,		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	iovannie	ž () ::	(So CAS#	7782-61-8	08	
	Lien	Formulated By:	Expanded Uncertainty +/- (µg/mL)	20.0		
	`			15	170	
	_	_	Actual Conc. (ug/1	10001.5		
	Nitric Acid	Nitric Acid	Actual Actual Weight (g) Conc. (ug/mL)	30.0090	160	260
	Lot # 20370011	(mL)	Target Weight (g)	30.0044	150	250
	Solvent:	5.0% srtainty uinty	Assay (%)	100.0		
	Ø.	5.0% Balance Uncertainty Flask Uncertainty	Uncertainty Assay Purity (%) (%)	0.10	04 641	240
	86	5E-05 B	Purity L	99.999		
	M5298	0000.41	Nominal Conc. (µg/mL)	10000	[1] Spectrum No.1 [30.763 sec]:58126.D# [Count] [Linear] 10 20 30 110 120 130	230
	<u>152</u> (Fe)	020425 Ambient (20 °C) 10000 6UTB ed to (mL): 3	Lot Number C	221035107	20 20 120	660
	58126 020422 Iron (Fe)	020425 Ambient 10000 6UTB			30.763 sec	
	Ser:	ate: ige: nL): oer: w was di	RM#) IN346	10 10 110 110 110 110 110 110 110 110 1	;
Tac	Part Number: Lot Number: Description:	Expiration Date: 020425 Recommended Storage: Ambient (20 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):		1. Iron(III) nitrate nonahydrate (Fe)	[1] Spectr	
CEBTIFIED WEIGHT BEDORT	0 7 2	Explommenc ncentrati NIST Te		nonahy	2.0E4 1.0E4 1.0E8 1.0E8 1.0E8 1.0E8 1.0E8	
ID WELD		Rec ninal Col	Compound	III) nitrate	c E	
FRTIFIE		Non	Com	1. Iron(
0	1					

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

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

255555
- American

(T)= Target analyte

Physical Characterization:

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



Certified by:

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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



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

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

							Trace M.	otolo	Vorifico	201	F. CO	2						ı	
							1	Cars	۱^		ייין כו	20	ug/mL)						
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Sb	<0.02	ű	<0.5	į.	200	H	70.00	-	200	11.11	000	,		3 ;	1	2	70.02	A	70.05
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Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

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

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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	
2	Byfill 0241 ischin	2					1000								
W	0.10 10.0 100.0134 100.0173 10000.4 20.0 7790-69-4 5 mg/m3 oct-24 1428 mg/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 LIZO42018A1	IN019		Lithium nitrate (Li)
SRM	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 (%)	98	Conc. (µg/mL)	Number	RM#		Dunodino
L	Attached oo.)	(Solvent Safety Info, On Attached on.)	(Soly	Uncertainty	Actual	Actual	Target	ASSAY	Nominal Punty Uncertainty Assay Target	runty	Nominal	707	i		7
	ition	SDS Information		Expanded								-			

1.056	0.0 8	m/z->∕ 500 250	20° 20° 10° 10° 10° 10° 10° 10° 10° 10° 10° 1	m/z->>
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Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

							Trace Me	stale	Varifics	tion	hy ICP.	MC	(lm/m/)						
SHIPPING IN		STREET, STREET	THE RESIDENCE OF THE PERSON NAMED IN			-	THE PARTY		2011124		1	2	(M)						
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В	<0.02	ರೆ	<0.02	Αn	<0.02	2	<0.02	P	<0.02	24	<0.2	S	40.02	E	<0.02	E	000	7 1	200

Physical Characterization:

(T)= Target analyte

Certified by:

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

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R: 03/01/23(124)



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									-			
CENTIFIED WEIGHT REPORT:						Lot #)			
Part Number: Lot Number:		57058			Solven	t: 2111022	Solvent: 21110221 Nitric Acid		T	Errore Br		
Description:		Cerlum (Ce)	3							0	K	
Section 2		00000			2%		Nitric Acid	-	Formulated By:	: Lawrence Barry	020623	Lon
Recommended Storage: Nominal Concentration (ug/mL):		020626 Ambient (20 °C) 1000	(Ç)			(JE)			1/2	to Herris	1	
NIST Test Number: 6UTB Weight shown below was diluted to (mL):	dilute	6UTB of to (mL):	1000.12	3E-05 E	5E-05 Balance Uncertainty 0.058 Flask Uncertainty		:		Reviewed By:	Pedro L. Rentas	29020	
		Ę		Purity 1	Nominal Purity Uncertainty Assay.	y Target	Actual	Actual	Expanded Uncertainty	SDS Information (Solvent Safety Info. On Attached pg.)	ation Attached pg.)	NIST
Compound	25. 25.		Number Conc. (ug/mL) (%) Purity (%) (%)	3	Purity (%) (%)		Weight (g)	Conc. (ug/mL)	Weight (g) Weight (g) Conc. (ug/ml.) +/- (ug/ml.) CAS#	CAS# OSHA PEL (TWA)	1D50	SRM

Compound	RM#	Lot Number	Nominal Conc. (vg/mL)	Purity (%)	Purity Uncertainty Assay (%) Purity (%) (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Actual Uncertainty Weight (g) Conc. (ug/mt.) +/- (ug/mt.)	Uncertainty +/- (ug/mL)	SS	(Solvent Safety Info. On Attached pg.) CAS# OSHA PEL (TWA) LD50	ched pg.) LD50	NIST
Cerium nitrate hexahydrate (Ce)	IN146	IN146 Z512CEB1	1000	88.988	0.10	32.8	3.04919	3.04921 1000.0	1000.0	2.0	II ==	¥.	ď Ž	AN AN
[1] Spectrum N	lo.1 [43.472	*ec]:58158.D#	[1] Spectrum No.1 [43.472 sec]:58158.D# [Count] [Linear]											$\ \cdot \ $
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Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS):

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by ICP-MS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.2
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Verification	<0.02	<0.02	<0.01	<0.02	402	<0.02	<0.02
letals	n	3	Mg	Mn	Hg	Mo	R
Trace M	<0.02	<0.02	<0.02	<0.02	8	40.02	<0.02
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	<0.02	<0.02	40.2	<0.02	Q .01	<0.02	<0.02
	A	Se	As	Ba	Be	滔	Ø

Physical Characterization:

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

(T)= Target analyte

My J. M.

Certified by:

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

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

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.

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

Compound	RM#	Lot Number	Nominal Purity Conc. (µg/mL) (%)	Punty) (%)	Purity Uncertainty Assay (%) Purity (%) (%)		Target Weight (g)	Actual Weight (g)	Expanded Actual Actual Uncertainty (Sc Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS#	Expanded Uncertainty +/- (ug/mL)	(Solv CAS#	SDS Information (Solvent Safety Info. On Attached pg.) NS# OSHA PEL (TWA) LD50	Attached pg.) LD50	NIST
1. Calcium carbonate (Ca)	IN014	INO14 caboragezat	10000 99.999	666'66	0.10	38.9	75.1990	75.2093	10001.4	20.0	471-34-1	5 mg/m3	ort-rat	3109a
[1] S ₁	[1] Spectrum No.1		2.2.2.4	8ec]:6	12.514 sec]:58120.D# [Count] [Linear]	<u> </u>	unt) [Line	ger]						
1.0E4														
m/z->	0	.0		0	.0	40000-4	000	0	2	0	0		001	
2. 4 4														
m/z->	0	120		0 0	140		150	180	170	0	180	000		
6.0E4														
m/z->	019	220		230	240		250	260						

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

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

							Trace Me	tals	Verificat	io Io Io	by ICP-N	MS ((ng/mL)		T				
SACTION OF	THE REAL PROPERTY.	NOT THE OWNER.	STATE OF THE STATE	1	THE PERSON NAMED IN	STORES OF	1500 NOT 150		THE STATE OF THE S	STATE OF THE PERSON NAMED IN	STATE	0		- Marine	THE PERSON AND PERSON				
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As	<0.2	පී	40.02	超	<0.02	Я	<0.02	Mg	10.0>	ő	<0.02	招	<0.02	Ag	<0.02	F	<0.02	>	<0.02
Ba	<0.02	ඊ	<0.02	3	<0.02	卢	<0.002	Ma	40.02	Z	<0.02	8	<0.02	Z	<0.2	Ę	<0.02	χρ	<0.02
Be	<0.01	Ö	<0.02	පී	40.02	Fe	40.2	Hg	<0.2	۵,	<0.02	R	<0.02	స	<0.02	E,	<0.02	¥	₹0.02
ã	<0.02	රි	40.02	පි	<0.02	2	<0.02	Mo	<0.02	盂	<0.02	Sm	<0.02	Ø	<0.02	Sn	<0.02	2	<0.02
m	<0.02	₫	<0.02	Αŭ	<0.02	£	<0.02	PZ	<0.02	×	40.2	Sc	<0.02	Ta	<0.02	Ħ	<0.02	Z	40.02

(T) = Target analyte

Physical Characterization:

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



Certified by:

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

^{*} 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.

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

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800-368-1131 www.absolutestandards.com	100				Certified	Refer	Since Ma	Certified Reference Material CRM	1/203 (A	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	ANAB ISO 17034 Accredited AR-1539 Certificate Number tps://Absolutestandards.com	credited Number rds.com
CERTIFIED WEIGHT REPORT:							Lot #		'	一				
Fart Number: Lot Number: Description:		57182 061522 Lead (Pb)			Solv	Solvent: 2	20510011	Nitric Acid		Hioram	ranvie Ea	peate		
Expiration Date:		081505				%	40.0	Nitric Acid		Formulated By:	Giovann	Giovanni Esposito	061522	
Recommended Storage: Nominal Concentration (µg/mL):		Ambient (20 °C) 10000	(2)				(JE)			Sh	Ha.	(A		
NIST Test Number: 6UTB Weight shown below was diluted to (mL):	r: 6 as diluted	6UTB ad to (mL):	2000.02	5E-05 I	5E-05 Balance Uncertainty 0.058 Flask Uncertainty	ainty				Reviewed By:	Pedro L.	Pedro L. Rentas	061522	
Compound	RM#	Lot	Lot Nominal Purity Uncertaint Number Conc. (µg/ml.) (%) Purity (%)	Purity (%)	Purity Uncertainty Assay (%) Purity (%) (%)	- 1	Target Weight (g)	Expanded Actual Actual Uncertainty Weight (g) Conc. (µg/mL) +/- (µg/mL)	Actual onc. (µg/mL)	Expanded Uncertainty (4+/- (µg/mL) CAS#	SD: (Solvent Safe S# OSHA	SDS information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LDSC	pg.) LD50	NIST

SRM

1. Lead(II) nitrate (Pb)	INO29 PBD122016A1	10000	99.999	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]	(ac):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



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

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

							Trace Me	stals	Verifica	tion	by ICP	SY	(ma/m)		,				
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ğ	<0.02	ඊ	<0.02	3	<0.02	,1	2000	Min	2002	Ď	5	10	9			1	70.0	P	7000
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E E	<0.02	රි	<0.02	ජී	<0.02	3	₹0.05	Wo	<0.02	Ā	<0.05	E.	2002	v	5	5	200	• [70.0
m	<0.02	Ĉ	<0.02	An	200	£	F	71%	5	4			7000	3 1	70.02	2	70.02	7	Z0:05
			7000	200	70'07		7	DNI	20.02	4	250	×	₹0.02	B	Ø.02	E	200	7.	3

Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 061522

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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

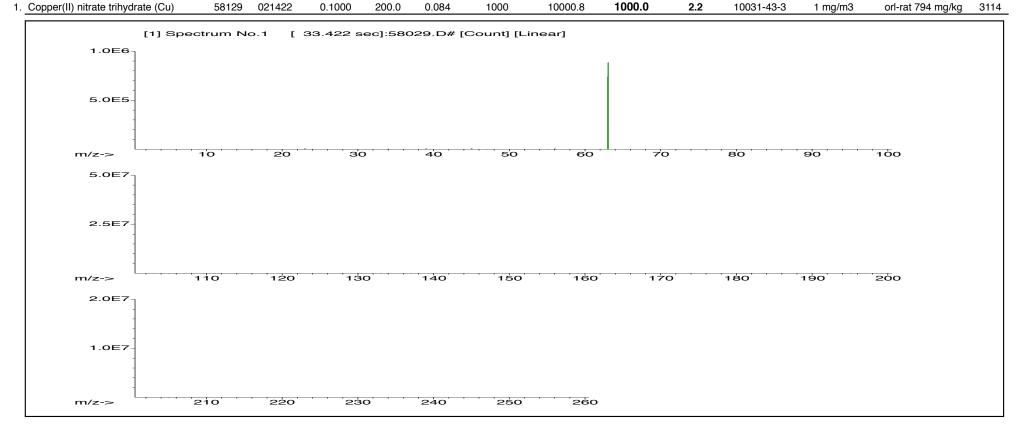
Formulated By: Eli Aliaga 102622

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. (μ g/mL) Conc. (μ g/mL) Conc. (μ g/mL) +/- (μg/mL) CAS# LD50





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.

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

Bur P. All

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



M5614 M5615 M5616 M5617 M5618 M5619

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 Cl2)	≤ 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)	≤ 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





M5625 M5626 M5627 M5628 M5629 M5630

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 ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 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



Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

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240		140		ò		
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250		150		0		
260		160		0		
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Part # 58024



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

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(I)= larget analyte

Physical Characterization:

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

Certified by:

* 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.

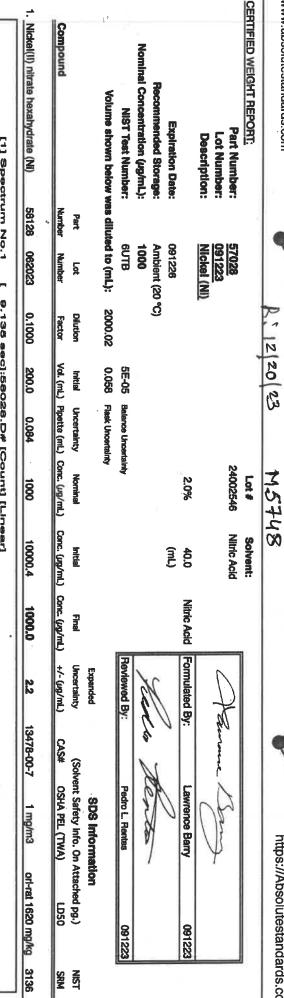
* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

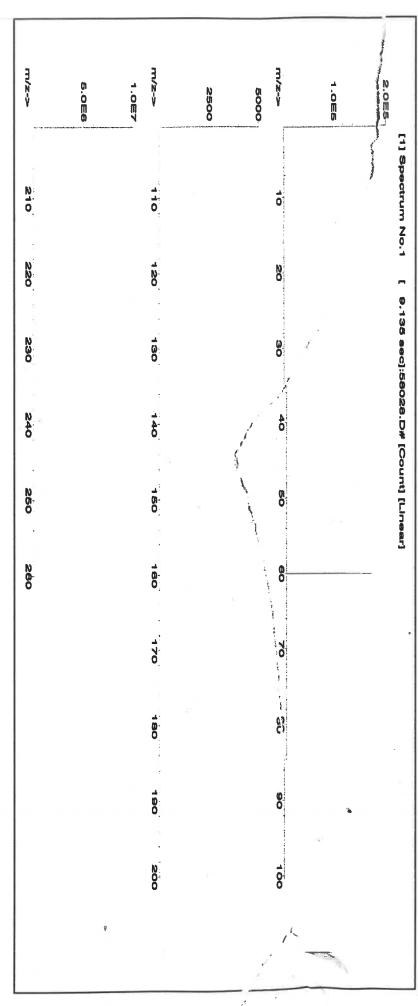
www.absolutestandards.com

Certified Reference Material CRM



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





www.absolutestandards.com

800-368-1131

Absolute Standards, Inc.

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

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Certified by:

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* All standard containers are meticulously cleaned prior to use.

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

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www.absolutestandards.com



M5768 [M576] (B) R:1/3/24 Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: Magnesium nitrate hexahydrate (Mg) IN030 марозгозат Compound Nominal Concentration (µg/mL): m/z-> ~-z/m m/z-> Weight shown below was diluted to (mL): Recommended Storage: 2.0≡4 1.0E4 5.0E5 1.0E6 1000 2000 NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 쭕 **BTUB** 58112 091823 10000 Ambient (20°C) (M5+18), (M5+16) 091826 Magnesium (Mg) Number 120 ğ 20 [19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.02 0.058 Flask Uncertainty 10000 Nominal 130 230 30 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) (%) 140 0.10 240 40 Solvent: 24002546 Nitric Acid 8.51 150 234.9118 Weight (g) Target Lot # Ē Weight (g) Conc. (µg/mL) 234.9126 Nitric Acid Actual 160 260 0 10000.0 Actual 170 6 +/- (µg/mL) Expanded Uncertainty Reviewed By: Formulated By: 20.0 180 80 13446-18-9 (Solvent Safety Info. On Attached pg.)
OSHA PEL (TWA) LD50 Pedro L. Rentas Lawrence Barry 190 **SDS Information** Ö Z 200 100 orl-rat 5440 mg/kg 3131a 091823 091823 SRM



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

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

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(1) = larget 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.
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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).



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:
 T2-MEB723367

 Matrix:
 5% (v/v) HNO3

Value / Analyte(s): 1 000 μg/mL ea:

Potassium,

600 µg/mL ea: Phosphorus,

300 μg/mL ea:

Sodium, Iron,

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

Density: 1.034 g/mL (measured at 20 \pm 4 °C)

Assay Information:

ANALYTE Ag	METHOD ICP Assay	NIST SRM# 3151	SRM LOT# 160729
Ag	Volhard	999c	999c
Ag	Calculated	9990	See Sec. 4.2
Ag Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
В	ICP Assay	3107	190605
Ва	ICP Assay	3104a	140909
Ва	Gravimetric	0.10.10	See Sec. 4.2
Be	ICP Assay	3105a	090514
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Се	ICP Assay	3110	090504
Се	EDTA	928	928
Со	ICP Assay	3113	190630
Со	EDTA	928	928
Cr	ICP Assay	3112a	170630
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	Traceable to 3152A	S2-NA700842
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Р	ICP Assay	3139a	060717
P	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
TI	ICP Assay	3158	151215
V	IC Assay	3165	160906
V 7n	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 One Method Characterization of CRM/RM by Two or More Methods Certified Value, X_{CRM/RM}, where two or more methods of characterization are Certified Value, $\mathbf{X}_{\text{CRM/RM}}$, where one method of characterization used is the weighted mean of the results: is used is the mean of individual results: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char a})$ X_i = mean of Assay Method i with standard uncertainty u_{char i} X_a = mean of Assay Method A with w_i = the weighting factors for each method calculated using the inverse square of u_{char a} = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM}$ = k ($u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$)^{1/2} CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{chara}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$ where u_{char} are the errors from each characterization method $u_{char\ a}$ = the errors from characterization u_{bb} = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) u_{lts} = long term stability standard uncertainty (storage) u_{ts} = transport stability standard uncertainty u_{ts} = 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)

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 30, 2022

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

11.2 Lot Expiration Date

- August 30, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date:	
- Sealed TCT bad Obell bale.	

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Line

Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: WW-LFS-2
Lot Number: T2-MEB715594

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 80.1 \pm 0.6 μ g/mL Molybdenum, Mo 40.04 \pm 0.24 μ g/mL Silica, SiO2 200.2 \pm 1.1 μ g/mL Tin, Sn 70.1 \pm 0.4 μ g/mL

Titanium, Ti $20.02 \pm 0.14 \mu g/mL$

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

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Mo	ICP Assay	3134	130418
Sb	ICP Assay	3102a	140911
SiO2	Calculated		See Sec. 4.2
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_{CRM/RM}, 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_i = mean of Assay Method i with standard uncertainty u_{char i} Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u_{char a} = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM}$ = k ($u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2$)^{1/2} CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 a + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum ((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)\right]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method u_{char a} = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty $\mathbf{u_{bb}}$ = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{lts} = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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- 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° 24° C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT **HF Note:** This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 17, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

 Sealed TCT Bag C 	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

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