

Prep Standard - Chemical Standard Summary

Order ID : 04699

Test : Metals Group 10

Prepbatch ID : PB156185,

Sequence ID/Qc Batch ID: LB129326,

Standard ID :

MP76793,MP76795,MP78443,MP79167,MP79168,MP79169,MP79171,MP79172,MP79173,MP79174,MP79175,MP79176,MP79177,MP79178,MP79179,MP79180,MP79181,

Chemical ID :

M4589,M4825,M4874,M4876,M4877,M4880,M4881,M4882,M4883,M4884,M4885,M4886,M4888,M4889,M4891,M4901, M4939,M4960,M4961,M5019,M5020,M5100,M5129,M5184,M5192,M5200,M5218,M5222,M5224,M5226,M5227,M5228, M5288,M5289,M5294,M5298,M5387,M5394,M5429,M5467,M5496,M5498,M5513,M5521,M5616,M5626,M5643,M5649, M5658,M5712,M5748,M5762,M5768,M5772,W2606,

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<u>Recipe</u> <u>ID</u> 169	<u>NAME</u> 1:1HNO3	<u>NO.</u> MP76793	Prep Date 08/16/2023	Expiration Date 02/03/2024	<u>Prepared</u> <u>By</u> Al-Terek Isaac	<u>ScaleID</u> METALS_SCA LE_2 (M SC-2)	ETTE_1 (ICP	Sarabjit Jaswal
<u>FROM</u>	1250.00000ml of M5626 + 1250.000	00ml of W26	506 = Final Q	uantity: 2500.0	00 ml		A) -	
Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	PipetteID	Supervised By

Recipe				Expiration	Prepared			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
170	1:1HCL	<u>MP76795</u>	08/16/2023	01/18/2024	Al-Terek Isaac	METALS_SCA	METALS_PIP	
						LE_2 (M SC-2)		08/16/2023
FROM	1250.00000ml of M5616 + 1250.000	00ml of W26	606 = Final Q	uantity: 2500.0	00 ml		A)	

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Recipe ID 919 FROM	NAME ICP AES INTERNAL STD 1.00000ml of M4961 + 10.00000ml o ml	<u>NO.</u> <u>MP78443</u> f M4960 + 1	Prep Date 12/01/2023 969.00000ml	Expiration Date 01/31/2024 of W2606 + 20	Prepared By Bin He .00000ml of M5	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_3 (A) aantity: 2000.00	Sarabjit Jaswal 12/04/2023
Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	<u>Supervised By</u> Sarabjit Jaswal

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Metals STANDARD PREPARATION LOG

Recipe ID 903 FROM	NAME ICP AES RINSE SOLN 200.00000ml of M5772 + 9800.0000	<u>NO.</u> <u>MP79168</u> 0ml of W260	Prep Date 01/30/2024 06 = Final Qu	Expiration Date 02/11/2024 antity: 10000.00	Prepared By Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/30/2024
Recipe ID 912	NAME ICP AES ICV SOLN	<u>NO.</u> MP79169	Prep Date 01/30/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/30/2024

0.02500ml of M5019 + 0.02500ml of M5020 + 0.02500ml of M5429 + 0.25000ml of M5218 + 0.25000ml of M5228 + FROM

10.00000ml of M5294 + 89.77500ml of MP79167 = Final Quantity: 100.000 ml

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904	NAME ICP AES ICSA SOLN	<u>NO.</u> MP79171	Prep Date 01/29/2024	Expiration Date 02/11/2024	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/30/2024
<u>FROM</u>	10.00000ml of M5129 + 90.00000ml	of MP79167	′ = Final Qua	ntity: 100.000 i	nl			

<u>Recipe</u> <u>ID</u> 3494	NAME ICP AES ICSAB SOLN-1	<u>NO.</u> MP79172	Prep Date 01/29/2024	Expiration Date 02/11/2024	Prepared By Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	0.10000ml of M4589 + 0.10000ml of 10.00000ml of M5129 + 10.00000ml						1	

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<u>Recipe</u> <u>ID</u> 907	NAME ICP AES STD S (S5)	<u>NO.</u> MP79173	Prep Date 01/29/2024	Expiration Date 02/11/2024	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
<u>FROM</u>	460.00000ml of M4939 + 5.00000ml 5.00000ml of M5224 + 5.00000ml of							I
Recipe				Expiration	Prepared			Supervised By

Recipe				Expiration	Prepared			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	Date	By	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
910	ICP AES STD S4	<u>MP79174</u>	01/29/2024	02/11/2024	Bin He	None	METALS_PIP ETTE_3 (A)	01/30/2024
FROM	100.00000ml of MP79167 + 100.000	00ml of MP	79173 = Final	Quantity: 200.	000 ml			

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<u>Recipe</u> <u>ID</u> 909	NAME ICP AES STD S3	<u>NO.</u> MP79175	Prep Date 01/29/2024	Expiration Date 02/11/2024	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
<u>FROM</u>	150.00000ml of MP79167 + 50.0000	0ml of MP7	9173 = Final (Quantity: 200.0	00 ml			

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
3913	ICP AES STD S2	<u>MP79176</u>	01/29/2024	02/11/2024	Bin He	None	METALS_PIP	
							ETTE_3 (A)	01/30/2024
FROM	16.00000ml of MP79173 + 184.0000	0ml of MP7	9167 = Final	Quantity: 200.0	00 ml			

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Metals STANDARD PREPARATION LOG

Recipe ID 911 FROM	NAME ICP AES CCV SOLN 100.00000ml of MP79167 + 100.000	<u>NO.</u> <u>MP79177</u> 00ml of MP	Prep Date 01/29/2024 79173 = Final	Expiration Date 02/11/2024 Quantity: 200.	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/30/2024
Recipe ID 3651	NAME LR CHECK 1	<u>NO.</u> MP79178	Prep Date 01/29/2024	Expiration Date 02/11/2024	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal

FROM 10.00000ml of M5288 + 18.00000ml of M5200 + 18.00000ml of M5498 + 18.00000ml of M5768 + 20.00000ml of M5289 + 9.00000ml of M5298 + 7.00000ml of MP79167 = Final Quantity: 100.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID 3652 FROM	NAME LR CHECK2 10.00000ml of M5387 + 2.50000ml o 5.00000ml of M5748 + 54.50000ml o					<u>ScaleID</u> None + 4.50000ml o	PipetteID METALS_PIP ETTE_3 (A) f M5184 +	Sarabjit Jaswal 01/30/2024
<u>Recipe</u> <u>ID</u> 2950	NAME ICP AES S1/CRI STOCK STD	<u>NO.</u> MP79180	Prep Date 01/26/2024	Expiration Date 02/08/2024	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal

 FROM
 0.03000ml of M4876 + 0.03000ml of M4877 + 0.05000ml of M4885 + 0.05000ml of M5298 + 0.05000ml of M5496 + 0.05000ml of M5658 + 0.06000ml of M4881 + 0.10000ml of M4874 + 0.10000ml of M4880 + 0.10000ml of M4883 + 0.10000ml of M4939 + 0.10000ml of M5184 + 0.10000ml of M5228 + 0.10000ml of M5521 + 0.15000ml of M4825 + 0.20000ml of M4886 + 0.20000ml of M4889 + 0.20000ml of M4891 + 0.20000ml of M5227 + 0.20000ml of M5748 + 0.25000ml of M5467 + 0.50000ml of M4901 + 0.50000ml of M5387 + 1.0000ml of M5192 + 1.0000ml of M5200 + 1.0000ml of M5288 + 1.0000ml of M5498 + 1.0000ml of M5768 + 2.0000ml of M4882 + 2.0000ml of M4884 + 87.13000ml of MP79167 = Final Quantity: 100.000 ml

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Recipe ID 2951	NAME ICP AES S1/CRI WORK STD	<u>NO.</u> MP79181	Prep Date 01/26/2024	Expiration Date 02/08/2024	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	
FROM	196.00000ml of MP79167 + 4.00000	ml of MP79	180 = Final Q	uantity: 200.00	0 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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	021121	02/11/2024	08/05/2021 / jaswal	08/05/2021 / jaswal	M4886



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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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	030221	03/02/2024	09/23/2021 / bin	09/22/2021 / bin	M4939
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	100721	10/07/2024	10/09/2021 / jaswal	10/08/2021 / jaswal	M4960



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58139 / Y, 10000 PPM, 500 ml	052521	05/25/2024	10/09/2021 / jaswal	01/25/2019 / jaswal	M4961
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	011421	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
			Evaluation	Data Onened /	Received Date /	Chemtech
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	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
			Evaluation		Received Date (Chamtach

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

ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
025 / Mn, 1000 PPM, 0 ml	060122	06/01/2025	07/01/2022 / bin	06/02/2022 / jaswal	M5184
02	25 / Mn, 1000 PPM,	25 / Mn, 1000 PPM, 060122	ItemCode / ItemName Lot # Date 25 / Mn, 1000 PPM, 060122 06/01/2025	ItemCode / ItemName Lot # Date Opened By 25 / Mn, 1000 PPM, 060122 06/01/2025 07/01/2022 /	ItemCode / ItemName Lot # Date Opened By Received By 25 / Mn, 1000 PPM, 060122 06/01/2025 07/01/2022 / 06/02/2022 /



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Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	051722	05/17/2025	07/01/2022 / bin	06/17/2022 / jaswal	M5192
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	100121	10/01/2024	07/01/2022 / bin	10/18/2021 / bin	M5227
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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 (Al) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	072122	07/21/2025	11/01/2022 / jaswal	09/18/2022 / jaswal	M5387
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB714159	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.	57103 / Li, 10000 PPM, 125 ml	070622	07/06/2025	01/30/2023 / bin	01/26/2023 / bin	M5429
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57058 / Cerium, 1000PPM, 100ML	020623	02/06/2026	03/06/2023 / bin	03/01/2023 / bin	M5467
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / AI, 10000 PPM, 500 ml	011623	01/16/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5496
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5498



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	061522	06/15/2025	03/19/2023 / bin	03/17/2023 / bin	M5513
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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)	22E1662006	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)	23B0262006	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	WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml	T2-MEB723367	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	WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml	T2-MEB715594	02/17/2027	12/11/2023 / bin	04/16/2023 / bin	M5649



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	060523	06/05/2026	08/28/2023 / jaswal	08/25/2023 / jaswal	M5658
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	23B0262006	05/08/2024	11/08/2023 / Al-Terek	01/13/2023 / Al-Terek	M5712
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Nickel (Ni) 1000PPM	091223	09/12/2026	01/02/2024 / bin	12/20/2023 / jaswal	M5748
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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.	58112 / Mg, 10000 PPM, 500 ml	091823	09/18/2026	01/08/2024 / bin	01/03/2024 / bin	M5768

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	23G1262003	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	DIW / DI Water	Daily Lab-Certified	10/24/2024	10/24/2019 / apatel	10/24/2019 / apatel	W2606
Seidler Chemical	DIW / DI Water	Daily Lab-Certified	10/24/2024			W2606



CERTIFICATE OF ANALYSIS

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custom Grade Solution		
Catalog Number:	CLPP-CAL-1		
Lot Number:	R2-MEB689870		
Matrix:	5% (v/v) HNO3		
Value / Analyte(s):	5 000 μg/mL ea: Calcium, Magnesium,	Potassium, Sodium,	
	2 000 µg/mL ea: Aluminum,	Barium,	
	1 000 μg/mL ea: Iron,		
	500 μg/mL ea: Nickel, Zinc, Manganese,	Vanadium, Cobalt,	
	250 μg/mL ea: Silver,	Copper,	
	200 μg/mL ea: Chromium,		
	50 μg/mL ea: Beryllium		

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

1.116 g/mL (measured at 20 \pm 4 °C)

Assay Information:

ANALYTE Ag	METHOD ICP Assay	NIST SRM# 3151	SRM LOT# 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
Са	ICP Assay	3109a	130213
Са	EDTA	928	928
Co	EDTA	928	928
Со	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
К	ICP Assay	3141a	140813
К	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
V	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 used is the weighted mean of the results:	Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	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
\mathbf{w}_{i} = the weighting factors for each method calculated using the inverse square of the variance: $\mathbf{w}_{i} = (1/u_{char})^{2} / (\Sigma(1/(u_{char})^{2}))$	uchar a = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² char + u ² bb + u ² lts + u ² ts) ^{1/2}	CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char a} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ¹
k = coverage factor = 2	k = coverage factor = 2
$\mathbf{u}_{char} = \left[\sum \left((w_i)^2 (u_{char})^2 \right)^{\frac{1}{2}} \text{ where } u_{char} = the errors from each characterization method} \right)^{\frac{1}{2}}$	uchar a = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	ubb = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
u _{te} = transport stability standard uncertainty	uts = transport stability standard uncertainty

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 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:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Manager, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines CEO, Senior Technical Director

Prul 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

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

1.043 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

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

11.2 Lot Expiration Date

- January 13, 2027

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines

M4589 R:7/2/2020 BH



CERTIFICATE OF ANALYSIS

tel: 800.669.6799 - 540.585.3030 fax: 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	on
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, Silicon, Titanium	Molybdenum, Tin,

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 7 µg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 5 μg/mL
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 5 μg/mL
Titanium, Ti	1 000 ± 7 μg/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
Мо	ICPAssay	3134	130418
Si	ICPAssay	3150	130912
Sn	ICPAssay	3161a	140917
Ti	ICPAssay	3162a	130925

The follow ing 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 $u_{char i}$ X_a = mean of Assay Method A with **w**_i = the weighting factors for each method calculated using the inverse square of uchar a = the standard uncertainty of characterization Method A the variance $w_i = (1/u_{char_i})^2 / (\Sigma(1/(u_{char_i})^2))$ CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²_{char} + u²_{bb} + u²_{lts} + u²_{ts})^{1/2} CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum_{i} ((\mathbf{w}_i)^2 (\mathbf{u_{char}}_i)^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method uchar a = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty ubb = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) ults = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

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 CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: ____

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

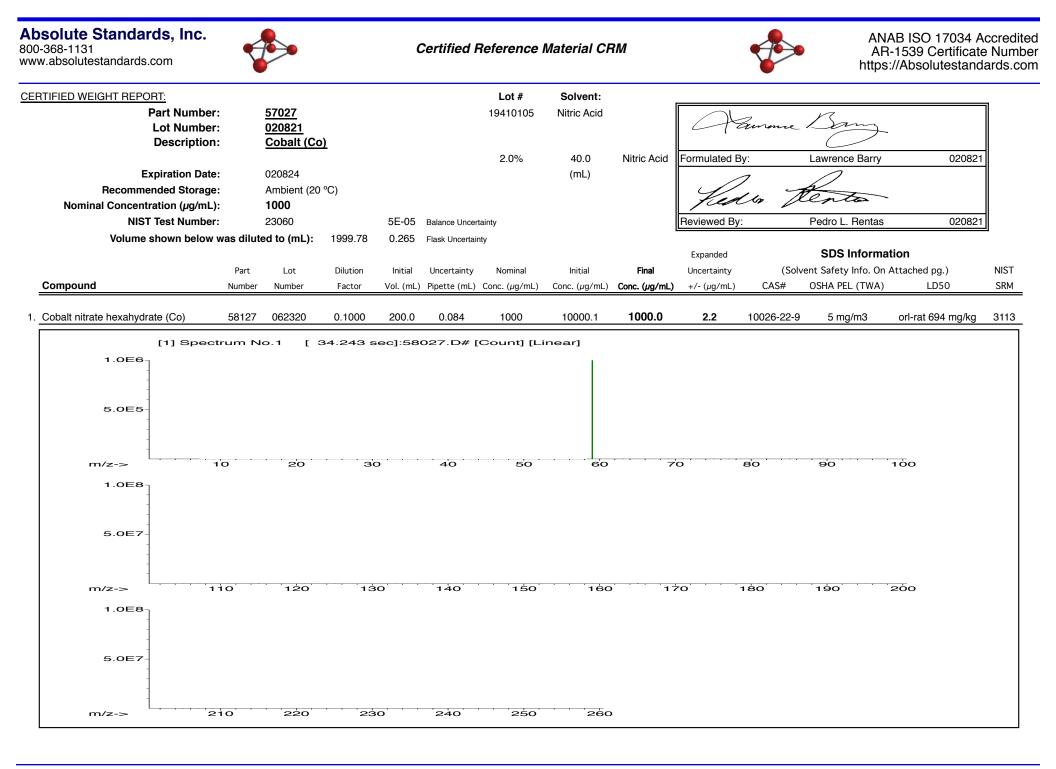
Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line





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	Ho	<0.02	Lu	< 0.02	Nb	<0.02	Re	<0.02	Si	< 0.02	Te	< 0.02	U	<0.02
As	<0.2	Ce	< 0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	< 0.02	Tl	<0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	< 0.02
Bi	< 0.02	Co	Т	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.

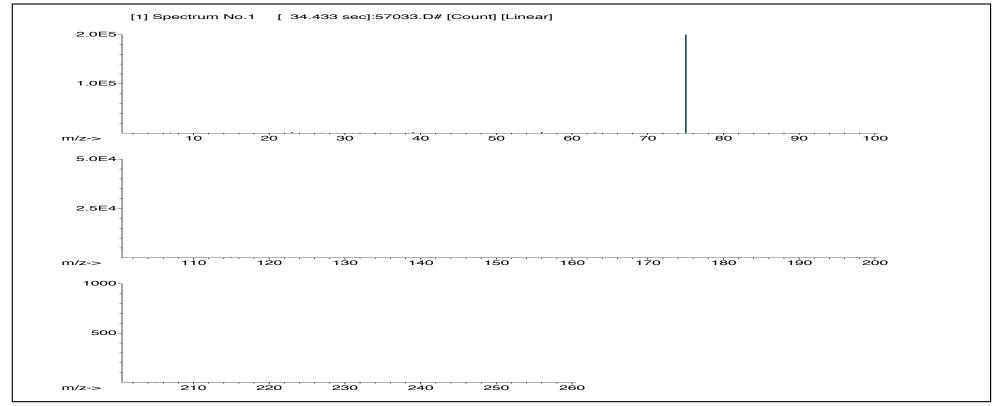
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- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines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

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Certified by:

solute Standards, Inc. -368-1131 v.absolutestandards.com	ť			(Certified F	Reference	Material CF	RM			AR-	B ISO 17034 A 1539 Certificate /Absolutestand	e Nur
TIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number:		<u>57033</u>				19410105	Nitric Acid			7	N		1
Lot Number:		<u>012521</u>							CTE	unme	Sam		
Description:		Arsenic (A	<u>.s)</u>								\bigcirc		
						2.0%	40.0	Nitric Acid	Formulated By	/:	Lawrence Barry	012521	
Expiration Date:		012524					(mL)			7	\wedge		
Recommended Storage:		Ambient (20	°C)						1 Sector	10 1	tento		
Nominal Concentration (µg/mL):		1000							Jun		-		1
NIST Test Number:		23060		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	012521	
Volume shown below wa	s dilute	ed to (mL):	2000.02	0.058	Flask Uncertair	nty							
									Expanded		SDS Informati	on	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On A	ttached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
Arsenic (As)	58133	092220	0.1000	200.0	0.084	1000	10001.0	1000.0	2.2	7440-38-2	0.2 mg/m3	orl-rat 763 mg/kg	3103





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	Т	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	Р	<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	Κ	<0.2	Sc	< 0.02	Та	<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.

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

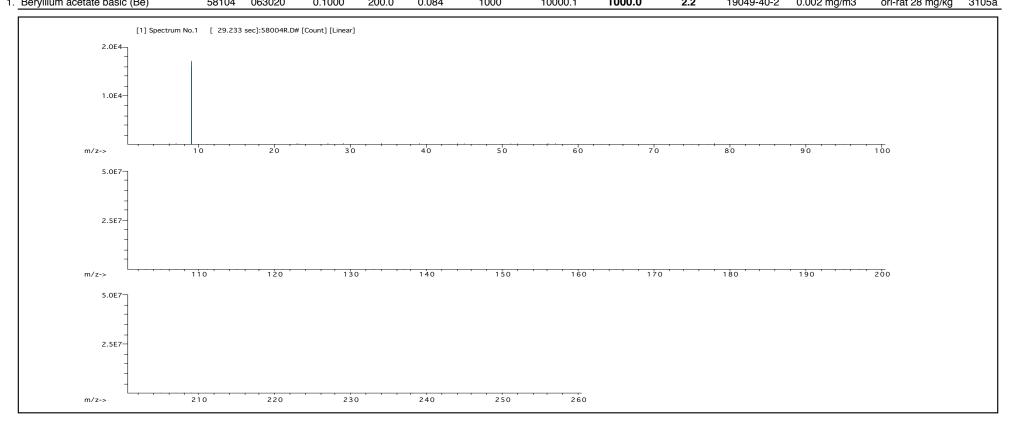
* All standards should be stored with caps tight and under appropriate laboratory conditions.

* 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).

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Certified by:

bsolute Standards, Inc. 00-368-1131 ww.absolutestandards.com	<			C	ertified l	Reference	Material CF	RM			AR	ANAB ISO 17034 Acc AR-1539 Certificate N https://Absolutestandarc				
ERTIFIED WEIGHT REPORT:						Lot #	Solvent:									
Part Number:		<u>57004</u>				19410105	Nitric Acid			~	R					
Lot Number:		030221							Cte	unme	Dang					
Description:		Beryllium	(Be)								\bigcirc					
						2.0%	40.0	Nitric Acid	Formulated B	y:	Lawrence Barry	03022	21			
Expiration Date:		030224					(mL)			1	\wedge					
Recommended Storage:		Ambient (20	0 °C)						4	11 7	tento					
Nominal Concentration (µg/mL):		1000							1000		4700					
NIST Test Number:		23060		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	03022	21			
Volume shown below v	vas dilute	ed to (mL):	2000.02	0.058	Flask Uncertai	nty										
									Expanded		SDS Informa	tion				
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On A	Attached pg.)	NIST			
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	3105			





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	<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	Т	Cr	<0.02	Ga	< 0.02	Fe	<0.2	Hg	<0.2	Р	< 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	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	Та	< 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.

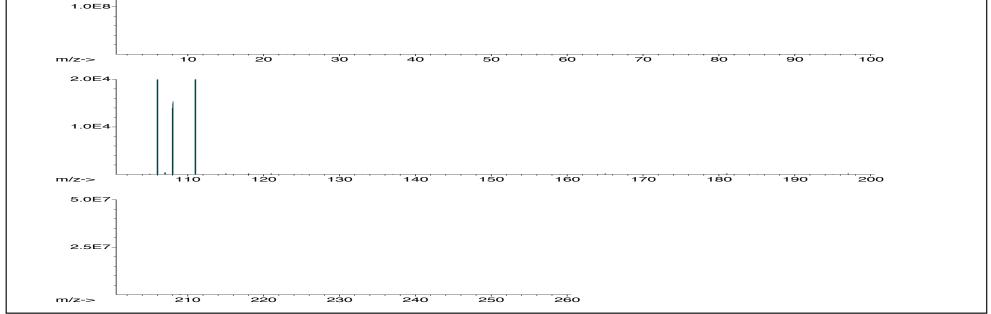
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Absolute Standards, Inc. 300-368-1131 vww.absolutestandards.com	ť			C	Certified I	Reference	Material CF	RM			AF	AB ISO 17034 A R-1539 Certificate :://Absolutestand	e Num
CERTIFIED WEIGHT REPORT: Part Number: Lot Number:		<u>57048</u> 072821	<i>(</i> -))			Lot # 20370011	Solvent: Nitric Acid		Hion	anné (Espocito	Þ	
Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):		Cadmium 072824 Ambient (20 1000				2.0%	40.0 (mL)	Nitric Acid	Formulated B	7	Giovanni Esposito	072821	-
NIST Test Number: Volume shown below w	/as dilute	6UTB	2000.02	5E-05 0.058	Balance Uncer Flask Uncertair				Reviewed By: Expanded		Pedro L. Rentas	072821	
Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL)	Nominal Conc. (µg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Uncertainty +/- (µg/mL)	(Solve CAS#	nt Safety Info. Or OSHA PEL (TWA)	Attached pg.) LD50	NIST SRM
1. Cadmium nitrate tetrahydrate (Cd)	58148	010920	0.1000	200.0	0.084	1000	10000.5	1000.0	2.2	10022-68-1	0.2 mg/m3	orl-rat 300 mg/kg	3108
[1] Spectr 2.0E8 1.0E8	rum Ne	o.1 [:	33.363 s	sec]:57(048.D# [Count] [Li	near]						





							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	< 0.02	Cd	Т	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	Те	< 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	Р	< 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	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	Та	<0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

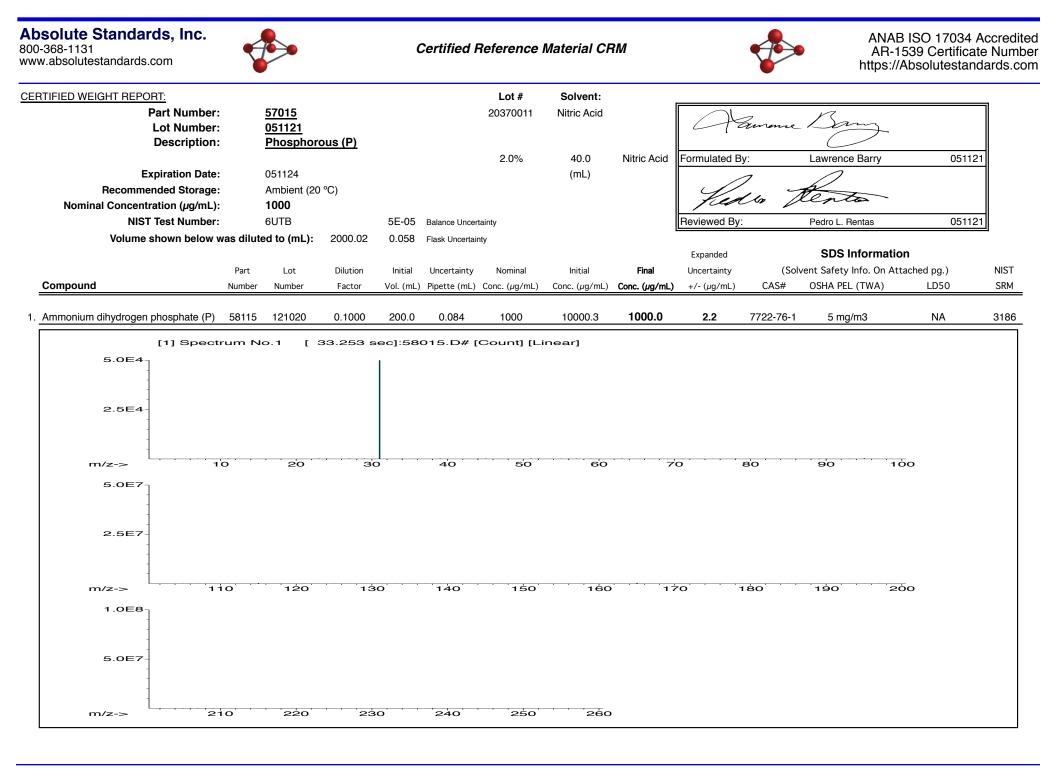
Homogeneity: No heterogeneity was observed in the preparation of this standard.



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							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
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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	Р	Т	Ru	<0.02	Sr	< 0.02	Tm	<0.02	Y	< 0.02
Bi	<0.02	Co	< 0.02	Ge	<0.02	La	<0.02	Мо	< 0.02	Pt	<0.02	Sm	<0.02	S	< 0.02	Sn	<0.02	Zn	< 0.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	Κ	<0.2	Sc	<0.02	Та	<0.02	Ti	<0.02	Zr	<0.02

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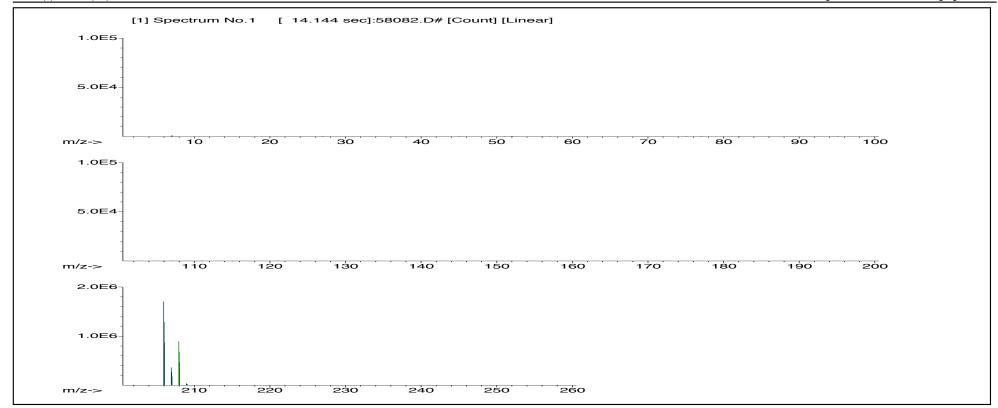
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Certified by:

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D-368-1131 w.absolutestandards.com				C	Certified F	Reference l	Material CF	RM			AR	AB ISO 1703 -1539 Certific //Absolutesta	ate Nur
RTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number:		57082				20370011	Nitric Acid			~	N		
Lot Number:		062221							Cte	anone	Dang		
Description:		Lead (Pb)											
						2.0%	40.0	Nitric Acid	Formulated B	y:	Lawrence Barry	062	221
Expiration Date:		062224					(mL)			1	\wedge		
Recommended Storage:		Ambient (20	°C)							1. 7	Rent -		
Nominal Concentration (µg/mL):		1000							Jun		eno		
NIST Test Number:		6UTB		5E-05	Balance Uncer	ainty			Reviewed By:		Pedro L. Rentas	062	221
Volume shown below w	as dilute	ed to (mL):	2000.02	0.058	Flask Uncertair	ıty							
									Expanded		SDS Informat	tion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent 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
Lead (II) Nitrate (Pb)	58182	032321	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	10099-74-8	0.05 mg/m3	intrvns-rat 93 m	





							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
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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
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Be	<0.01	Cr	< 0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	<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	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	Т	Nd	<0.02	Κ	<0.2	Sc	<0.02	Ta	< 0.02	Ti	<0.02	Zr	< 0.02

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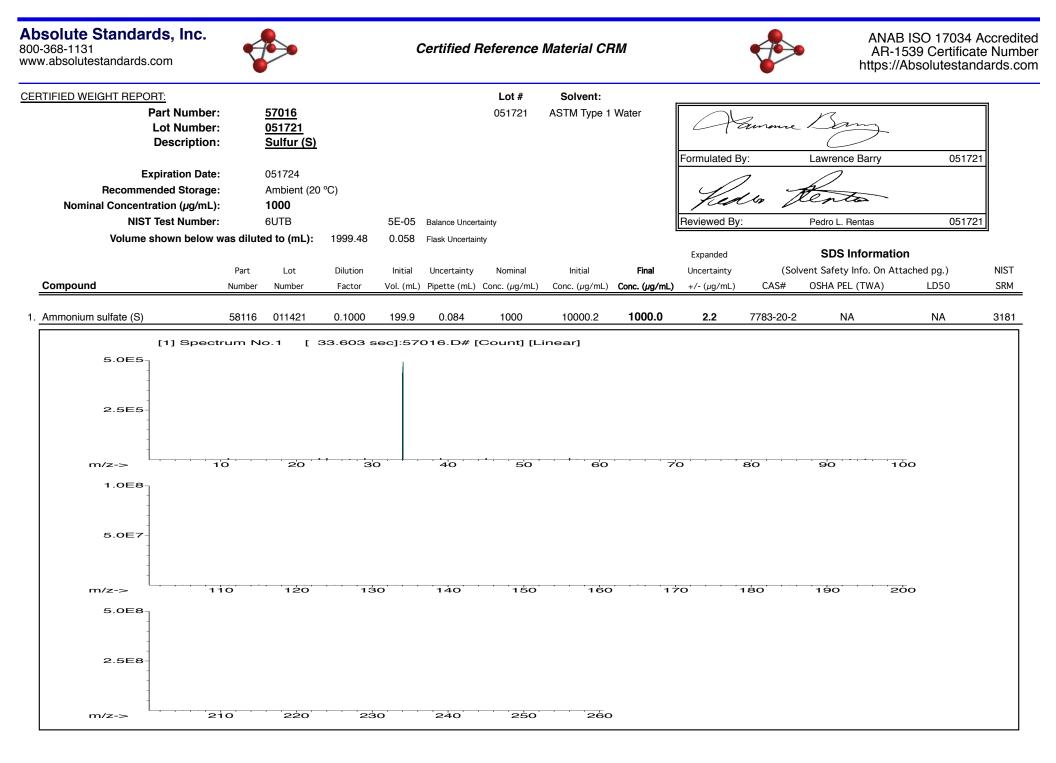
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							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	< 0.02	Dy	<0.02	Hf	< 0.02	Li	< 0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	<0.02	Но	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	T1	<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	Р	<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	Мо	<0.02	Pt	<0.02	Sm	<0.02	S	Т	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	Та	<0.02	Ti	<0.02	Zr	< 0.02

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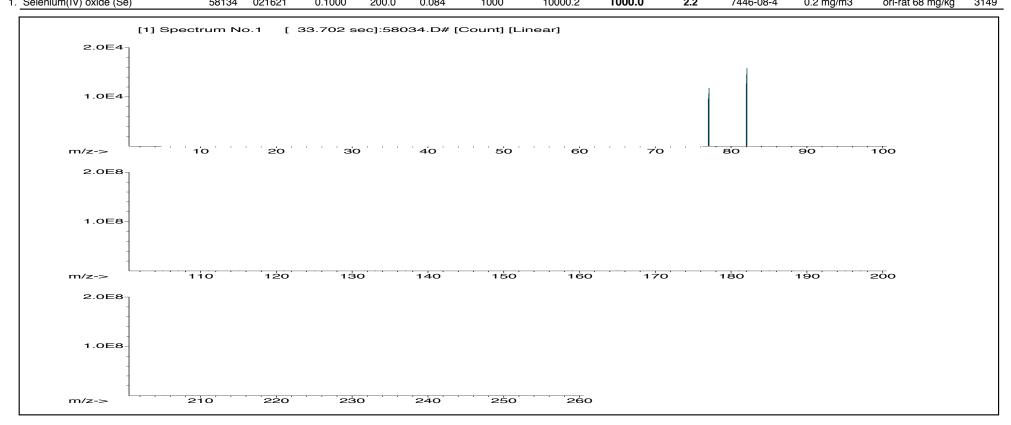
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bsolute Standards, Inc. 00-368-1131 ww.absolutestandards.com	-			C	Certified I	Reference	Material CF	RM			AR AR	AB ISO 17034 A 1539 Certificat //Absolutestanc	e Num
ERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number	:	<u>57034</u>				20370011	Nitric Acid		01	Ð	1 +		
Lot Number	:	070221							Lion	anne	Esposito		
Description	:	Selenium	<u>(Se)</u>								L		
						2.0%	40.0	Nitric Acid	Formulated B	y:	Giovanni Esposito	070221	
Expiration Date	:	070224					(mL)			7	\wedge		
Recommended Storage	:	Ambient (20) °C)						4	1, 7	tento		
Nominal Concentration (µg/mL)	:	1000							- Jan		una		
NIST Test Number	:	6UTB		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	070221	
Volume shown below	was dilute	ed to (mL):	2000.02	0.058	Flask Uncertair	nty							_
									Expanded		SDS Informat	ion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Sol	vent Safety Info. On /	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





							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	Т	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	Те	< 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	Р	< 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	Та	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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

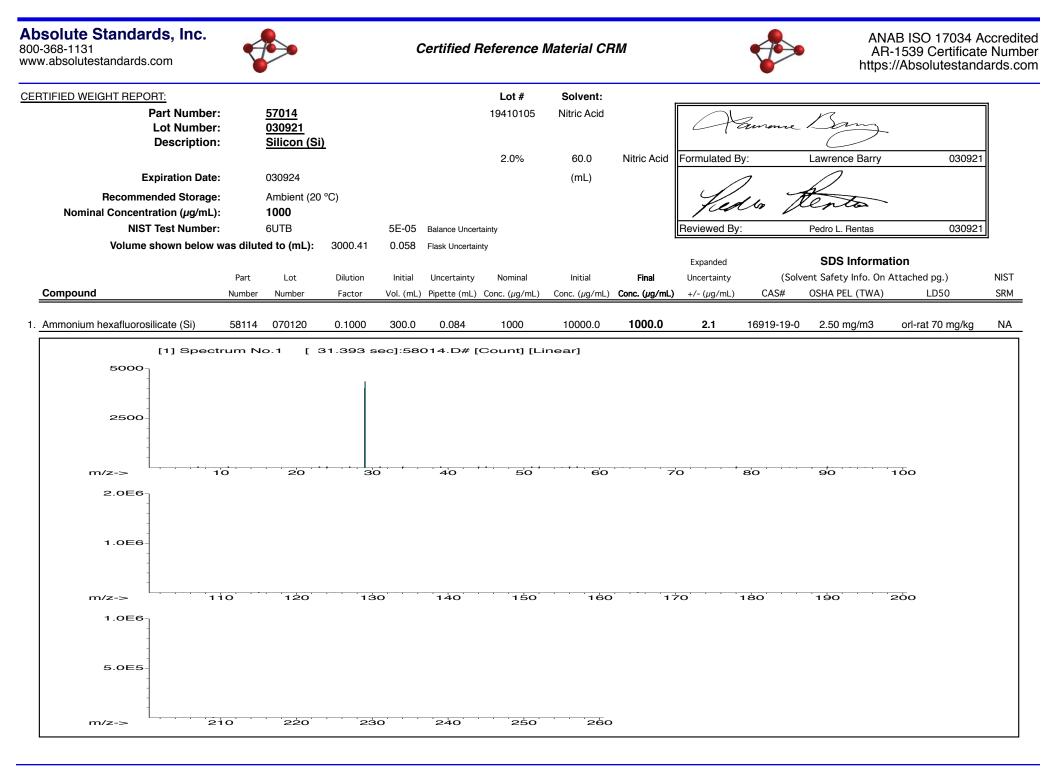
Bort. All

Certified by:

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

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

- * All standard containers are meticulously cleaned prior to use.
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- * All standards should be stored with caps tight and under appropriate laboratory conditions.
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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	Ho	< 0.02	Lu	< 0.02	Nb	<0.02	Re	<0.02	Si	Т	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	Р	< 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	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

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bsolute Standards, Inc 00-368-1131 ww.absolutestandards.com				(Certified R	leference l	Material CF	RM			A	R-1539 (17034 Ac Certificate lutestanda	Nur
ERTIFIED WEIGHT REPORT:						Lot #	Solvent:							
Part Num	per:	57047				20370011	Nitric Acid		. 1	~	c 4			
Lot Num		072921							Dino	inne	Esposito	>		
Descripti	ion:	Silver (Ag)												
						2.0%	40.0	Nitric Acid	Formulated By	/:	Giovanni Esposito		072921	
Expiration D	ate:	072924					(mL)			7	\wedge			
Recommended Stora	age:	Ambient (20	°C)								tento	_		
Nominal Concentration (µg/r	nL):	1000							Pen	6 /	lento			
NIST Test Num	ber:	6UTB		5E-05	Balance Uncerta	ainty			Reviewed By:		Pedro L. Rentas		072921	
Volume shown belo	ow was dilut	ed to (mL):	2000.02	0.058	Flask Uncertain	ty								
		. ,							Expanded		SDS Inform	ation		
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Sol	vent Safety Info. Or	n 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)		D50	SRM
I. 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	315 ⁻
	50147	010020	0.1000	200.0	0.004	1000	10000.4	1000.0	2.2	7701-00-0	To ug/mo			015
1000-														
m/z->	10	20	30	· · ·	40	50	60	~ ~ ~ 7	0 8	во	90	100		
m/z->	10	20	30	· · ·	40	50	60	7	0 8	зо	90	100		
	10	20	30		40	50	60		0	30	o'e	100		
5.0E5	10	20			40	150	60			80	90	100		
5.0E5 - - 2.5E5- - -														
5.0E5 2.5E5- m/z->														



							Trace M	etals	s 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	Т	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	Р	<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	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	Κ	<0.2	Sc	<0.02	Та	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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

Bort. All

Certified by:

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

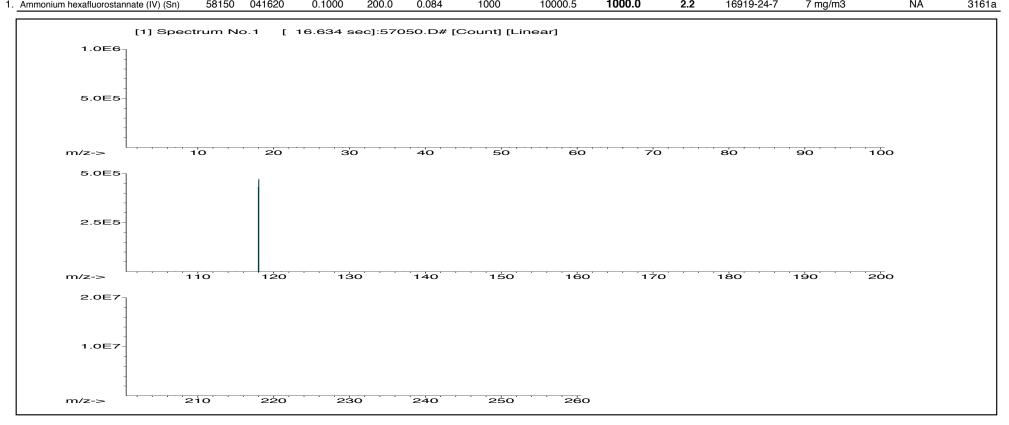
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bsolute Standards, Inc. 10-368-1131 ww.absolutestandards.com	5			C	Certified I	Reference	Material CF	RM			AR-	B ISO 17034 / 1539 Certifica //Absolutestan	e Num
ERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number	:	57050				19410105	Nitric Acid			~	N		
Lot Number	:	021121				240241	Hydrochloric a	acid	Cta	mone	Dang		
Description	:	Tin (Sn)									\bigcirc		
						2.0%	40.0	Nitric Acid	Formulated By		Lawrence Barry	02112	1
Expiration Date	:	021124				6.0%	120.0	Hydrochloric acid		,	\wedge		
Recommended Storage	:	Ambient (20	°C)				(mL)			. 7	lento		
Nominal Concentration (µg/mL)	:	1000							Fiel	6	ento-		
NIST Test Number	:	23060		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	02112	1
Volume shown below	was dilut	ed to (mL):	1999.78	0.265	Flask Uncertai	nty							
									Expanded		SDS Informat	ion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On A	ttached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
Ammonium hexafluorostannate (IV) (Sn)	58150	041620	0 1000	200.0	0 084	1000	10000 5	1000.0	2.2	16919-24-7	7 ma/m3	NA	3161





							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	Р	<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	Т	Zn	< 0.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	< 0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Та	< 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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Certified by:

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solute Standards, Inc. 368-1131 absolutestandards.com	5			C	Certified I	Reference l	Material CF	RM			A	R-1539	O 17034 A Certificate olutestanda	e Ni
TIFIED WEIGHT REPORT:						Lot #	Solvent:							
Part Numb Lot Numb Descripti	er:	<u>57022</u> <u>070721</u> Titanium (Ti)			20370011	Nitric Acid		A	Zurronne	Ban]
•						2.0%	40.0	Nitric Acid	Formulated B	/:	Lawrence Barry	y	070721	
Expiration Da Recommended Stora Nominal Concentration (µg/n	ge:	070724 Ambient (20 1000	°C)				(mL)		Yen	1 10 7	Pento	_		
NIST Test Numb		6UTB		5E-05	Balance Uncer	rtainty			Reviewed By:		Pedro L. Rentas		070721	
Volume shown belo			2000.02	0.058	Flask Uncertai				Expanded	<i>(</i> 2 .	SDS Inform			_
Compound	Part Number	Lot Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette	Nominal Conc. (µg/mL)	Initial	Final Conc. (µg/mL)	Uncertainty +/- (µg/mL)	(Solv CAS#	ent Safety Info. C OSHA PEL (TWA		d pg.) LD50	NI SI
ammonium hexafluorotitanate (Ti)	58122 octrum N		0.1000 34.693 s	200.0 ec]:570	0.084	1000 Count] [Lii	10000.1 near]	1000.0	2.2	16962-40-6	2.5 (F) mg/m3	3	NA	31
1.0E5 5.0E4														
m/z->	10	20		<u> </u>	40	50	60	70	0	во	90	100		
2.0E8														
1.0E8-														
-														

210

230

220

240

5.0E7

2.5E7-

m/z->

250

260



							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	Р	<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	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	Та	< 0.02	Ti	Т	Zr	<0.02

(T)= Target analyte

Physical Characterization:

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

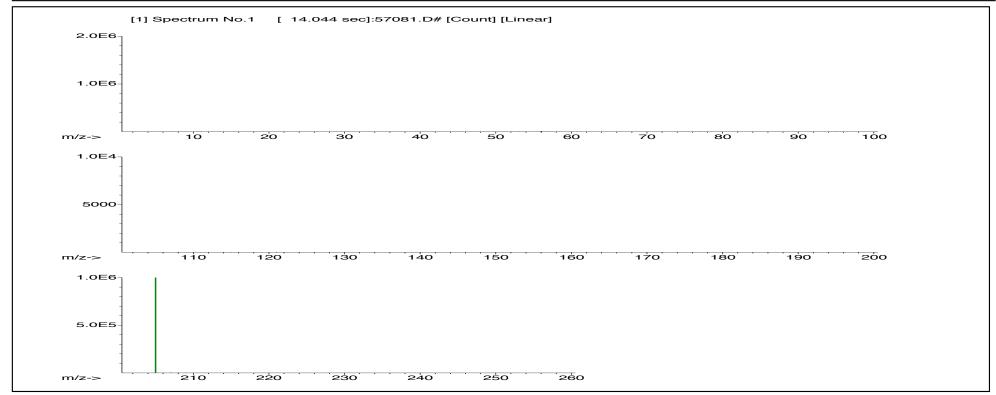
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Disolute Standards, Inc. 0-368-1131 w.absolutestandards.com	1			C	ertified F	Reference l	Material CF	RM .			AR-	B ISO 17034 1539 Certifica //Absolutestan	te Nur
RTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number: Lot Number: Description:	C	57081)73021 Fhallium (*	<u>TI)</u>			20370011	Nitric Acid		Giove	nni !	Esposito		
						2.0%	40.0	Nitric Acid	Formulated By	/:	Giovanni Esposito	07302	1
Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	ļ)73024 Ambient (20 1 000	°C)				(mL)		Jun	1 5 1	tento		
NIST Test Number:	6	BUTB		5E-05	Balance Uncert	ainty			Reviewed By:		Pedro L. Rentas	07302	1
Volume shown below was	diluted	d to (mL):	2000.02	0.058	Flask Uncertair	ity		-	Expanded		SDS Informati	on	
P	art	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On A	ttached pg.)	NIST
Compound Nu	mber	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
Thallium (TI) 58	181	060920	0.1000	200.0	0.084	1000	10001.0	1000.0	2.2	7440-28-0	0.1 mg/m3	orl-rat 6700 mg/kg	315





							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	Те	< 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	Т	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	Р	<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	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	Та	<0.02	Ti	<0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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



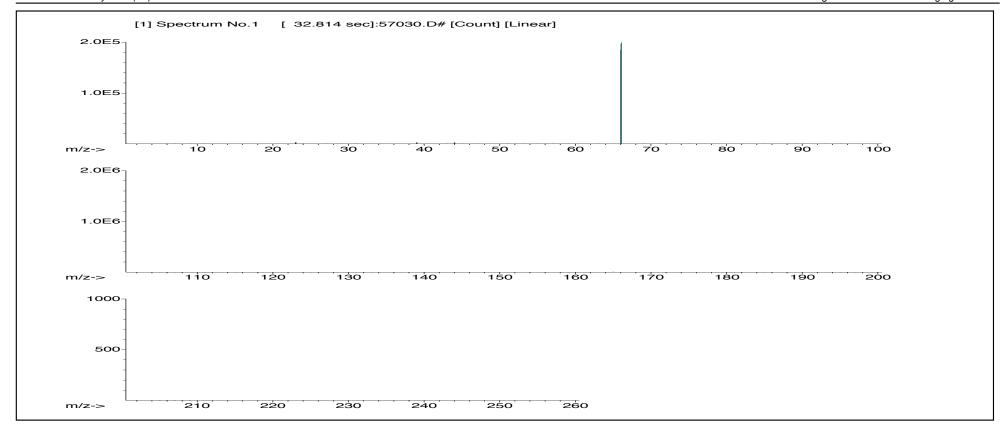
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Absolute Standards, Inc. 00-368-1131 www.absolutestandards.com	4			C	Certified I	Reference l	Material CF	RM			AR AR	AB ISO 17034 A -1539 Certificate ://Absolutestand	e Numb
ERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number:		<u>58030</u>				20370011	Nitric Acid		.1	æ	< +		1
Lot Number:		<u>031921</u>							Liova	nne '	Esposito		
Description:		Zinc (Zn)									L		
						2.0%	40.0	Nitric Acid	Formulated By		Giovanni Esposito	031921	1
Expiration Date:		031924					(mL)			7	\wedge		
Recommended Storage:		Ambient (20	°C)						1 Sector	1 7	Kento		
Nominal Concentration (µg/mL):		1000							Jun		4700		
NIST Test Number:		6UTB		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	031921	
Volume shown below w	as dilute	ed to (mL):	2000.02	0.058	Flask Uncertair	nty							
									Expanded		SDS Informa	tion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Sol	vent Safety Info. On	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
I. Zinc nitrate hexahydrate (Zn)	58130	082020	0.1000	200.0	0.084	1000	10000.3	1000.0	2.2	10196-18-6	1 mg/m3	orl-rat 1190mg/kg	3168





							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	Те	< 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	Р	< 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	Мо	< 0.02	Pt	<0.02	Sm	< 0.02	S	< 0.02	Sn	< 0.02	Zn	Т
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	Κ	<0.2	Sc	<0.02	Та	< 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:

Burg. All

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

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

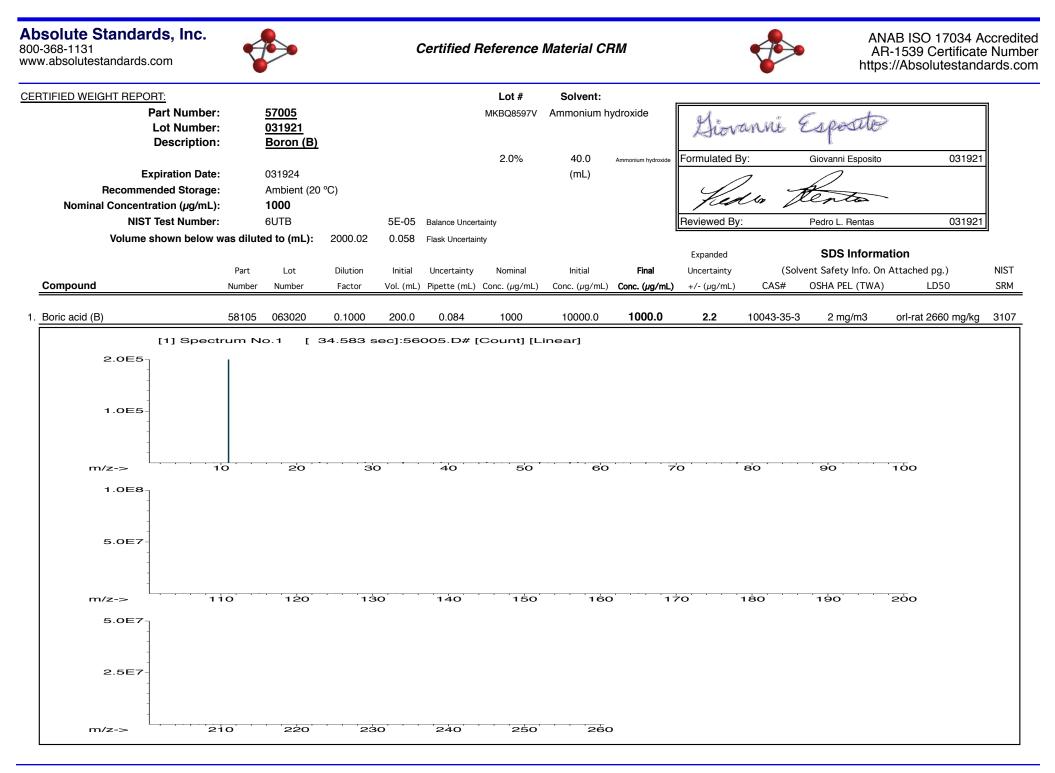
* All standard containers are meticulously cleaned prior to use.

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							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	Р	< 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	Т	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Та	< 0.02	Ti	< 0.02	Zr	< 0.02

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m/z-> 210	2.567	m/z-> 110	5.0E7-	830	m/z>	1.0E5 - -	2.0ES	[1] Spectrum No.1		Compound	Volume shown below was diluted to (mL):	NIST Test Number:	Recommended Storage: Nominal Concentration (µg/mL):	Expiration Date:	Lot Number: Description:	CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
220		120			20			[32.093 sec]:58003.D# [Count] [Linear]	11	Part Lot Number Number	diluted to (mL):	23060	Ambient (20 °C) 1000	030224	<u>030221</u> Lithium (Li)		*
230		130			30			Count] [Linear]	0 1000	Dilution	2000.02		ĉ		D		
240		140			40			200.0	2000	Initial Uncertainty Vol. (mL) Pipette (mL)	0.058 Flask t	5E-05 Balanc					Certii
								0.084 1000		Uncertainty Nominal Pipette (mL) Conc. (µg/mL)	Flask Uncertainty	Balance Uncertainty			2.0%	Lot #	ied Referen
250 260		150 160			si0 60			10000.5		al Initial /mL) Conc. (µg/mL)		į			40.0		Certified Reference Material CRM M49
		170			70			1000.0	1000 0	Final Conc. (µg/mL)					Nitric Acid	٦	m M49
		•		191	20			2.2		Uncertainty +/- (µg/mL)	Expanded	Reviewed By:	1h	<u>.</u>	Formulated By:		39
		180 1			08			7790-69-4		(Solvent S	6	Ped	in the		a former of		R
		061			a)			5 mg/m3		(Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50	SDS Information	Pedro L. Rentas	and .	0	Lawrence Barry		20 9/22/14 AR-
		200		i	100			ori-rat 1426 mg/kg		Attached pg.) LD50	lion	030221					R: 0 // 22/VANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
								NA		NIST						4	e Number ards.com

1 of 2

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Part # 57003

Lot # 030221

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Certified Reference Material CRM



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

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

							Irace M	letals	Verifica	tion	by ICP-N	N) SI	g/mL)						
2	<0.02	Cd	<0.02	Dv	40.02	Hf	<0.02	5.	Т	N.	40.02	P.	40.02	*	A) 2	TH I	<0.02	W	40.02
SP :	<0.02	2 2 2	40.2	ц. 2	<0.02	Но	<0.02	5 5	<0.02	R a	<0.02	Re	<0.02	Si f	40.02	Te	<0.02	c :	40.02
As	<0.2	င့	<0.02	Eu	<0.02	5	<0.02	Mg	<0.01	SO	<0.02	Rh	<0.02	Ag	<0.02	T	<0.02	<	<0.02
Ba	<0.02	S	<0.02	Gd	<0.02	Ŀ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Ъ	<0.02	YЪ	<0.02
Be	<0.01	Q	<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	S	<0.02	ଜ	<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	ç	40.02	Au	<0.02	РЪ	<0.02	Nd	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	T	<0.02	27	<0.02

(T)= Target analyte

Physical Characterization:

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

Son P. Shirt

Certified by:

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

Part # 57003 Lot # 030221

m/z->	N. 55 100	m/z-≻ 5.0E6	1.006	11/2-2 2.0E6	2.5E7	5.0E7	1. Indium Oxide (In)	Compound	Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	Expi	CERTIFIED WEIGHT REPORT: Part Lot	www.absolutestandards.com
210		110		10		[1] Spectrum No.1	IN086	RM#	Recommended Storage: Ambient (J Il Concentration (Jug/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Expiration Date:	<u>ORT:</u> Part Number: Lot Number:	п
220		120		NO		-	86 W1096A		Ambient (20 °C) 10000 6UTB uted to (mL): 50	100724	58149 100721 Indium (In)	
230		130		30		12.965 sec]	10000 99.999	Nominal Purity Conc. (µg/mL) (%)	0.06		-	NAGIO
240		140		4 0		12.965 sec]:57049.D# [Count] [Linear]	0.10	Uncertainty Purity (%)	5E-05 Balance Uncertainty 0.058 Flask Uncertainty		Solvent:	R: 10/08
250		150		50		[Count] [Lin	82.6 6.05408	Assay Target (%) Weight (g)	inty Y	5% 25.0 (mL)	Lot # ent: 20370011	121
260		160		0		ear]	6.05441	Actual Weight (g)		Nitric Acid	Nitric Acid	Ð
		170		70			10000.6 2	Exp Actual Unce Conc. (µg/mL) +/- (Revi	Form	re	
		180		80			20.1 1312-43-2	Expanded Uncertainty (Sol +/- (µg/mL) CAS#	Reviewed By:	Formulated By:	fioranci	
		190		00			NA	SDS Informa olvent Safety Info. On OSHA PEL (TWA)	Pedro L. Rentas	Giovanni Esposito	Cape	
		200		100			NA	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50			A	https://Absolutestandards.com
	n an						3124a	NIST	100721	100721		tandards.co

1 of 2

Part # 58149

Lot # 100721

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



Certified Reference Material CRM



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

							Trace Me	etals	Verificat	ion b	y ICP-MS	(hð	/mL)	- 1					
2	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	5	<0.02	N.	<0.02	- PA	<0.02	Sel	40.2	1 41 1	40.02	W	40.02
Sb	<0.02	Ca	<0.2	Ę	<0.02	Но	<0.02	5	<0.02	Nb	<0.02	Re	<0.02	S	<0.02	Te	<0.02	с	<0.02
As	<0.2	Ce	<0.02	E	<0.02	In	Т	Mg	<0.01	õ	<0.02	Rh	<0.02	Ag	<0.02	Н	<0.02	<	<0,02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ŀ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	40.2	Th	<0.02	ΥЪ	<0.02
Be	<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	Y	<0.02
Bi	<0.02	C ₀	<0.02	ଜୁ	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	2	<0.02
в	<0.02	Cu	<0.02	Au	<0.02	РЬ	<0.02	Nd	<0.02	~	<0.2	Sc	<0.02	Ta	<0.02	Н	<0.02	Z	<0.02

(I)= larget analyte

Physical Characterization:

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

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Certified by:

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Part # 58139 Lot # (m/z->	1.0E5	m/z-> 2.0E5	2.5E4	m/z-> 5.0E4	1.0E6	2.0E6	1. Yttrium (III) Oxide (Y)	Weight show Compound	NIST T	Recommended Storage: Nominal Concentration (µg/mL):	Π	<u>ventiried weight heront.</u> Lot Des	800-368-1131 www.absolutestandards.com	Absolute Standards, Inc.
Lot # 052521	210		110		10		[1] Spectrum No.1	INOR	Weight shown below was diluted to (mL):	NIST Test Number:	nended Storage: ntration (µg/mL):	-	Part Number: Lot Number: Description:	1 3	s, Inc.
	220		120		N 0		_	IN087 YV012015B1		6UTB	Ambient (20 °C) 10000	0.000	<u>58139</u> 052521 Yttrium (Y)		
	230		130		â		12.624 sec	10000 99	2000.02 0.0 Nominal PL Conc. (µg/mL) ()	5E	°C)	ŀ		M4961	
	240		140		40		12.624 sec]:58139.D# [Count] [Linear]	99.999 0.10	0.058 Flask Uncertainty Purity Uncertainty As (%) Purity (%) (5E-05 Balance Uncertainty			Solvent:	R: D	>
1 of 2	250		150		л О		[Count] [Lin	77.9 25.6744	inty Assay Target (%) Weight (g)	ainty	(111)	2% 40.0	Lot # 20370011	Certified Herefence Material CHM $R \gtrsim \left[0/08/2\right]$	
	260		160		Ø		ear]	25.6745	Actual Actual) Weight (g) Conc. (µg/mL)			Nitric Acid	Nitric Acid		
			170		70			10000.0		Re		Fo]		
			180		80			20.0 1314-36-9	Expanded Uncertainty (1 +/- (µg/mL) CAS#	Reviewed By:	Herein	Formulated By:	Ada		5
Printed: 10/7/2			190		9 0			6-9 NA	Solvent 0	Pedro L. Rentas	then	Lawrence Barry	une B		
Printed: 10/7/2021, 2:18:04 PM			200		100				SDS Information Safety Info. On Attached SHA PEL (TWA)	ntas	81	arry	Vr	AR-1539 (https://Abso	ANAB ISO
PA	τ.							NAN	0	052521		052521		AR-1539 Certificate Number https://Absolutestandards.com	ANAB ISO 17034 Accredited
						en de la companya de		NA	NIST					s.com	edited

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



Certified Reference Material CRM



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

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

<0.02	Zr	<0.02	Ti	<0.02	12	20.02	90	7.0>	2	10.02	210				4	And the other designs of the o			Contraction of the local division of the loc
<0.02	211	10.01	01		1	2	2	5	4	33	N	2002	Ph	<0.02	Au	<0.02	Cu	20.02	B
3	7	200	5	c0 0>	2	<0.02	Sm	<0.02	Pt	<0.02	Mo	<0.02	La	20.02	2	70.02	5	10.01	J !
-	Y	<0.02	Tm	<0.02	Sr	<0.02	Ru	<0.02	7	7.0>	gu	101		0.01	2	202	5	<0.02	<u>R</u> .
20.02	ID	20.02	111	10.2	144	10.01	1	10.01	, ;	3	H.	5	ជ	300	<u>_</u>	40.02	ç	<0.01	Be
	\$	3	ţ	5	Ş	000	R	2002	Pd	<0.02	Mn	<0.02	Ir	<0.02	Gd	20.02	S	20.02	La
<0.02	<	<0.02	П	<0.02	Ag	<0.02	Rh	<0.02	Os	<0.01	Mg	<0.02	III	10.02		0.01	2		ជ
<0.02	0	<0.02	Je	20.02	IC	10.02	20	10.02	110	10.01	: 1	3	5	502	IJ	c0 0>	C.	<0.2	As
10.01	: :		4	3	2	3	D	200	Ş	c0 0>	I m	<0.02	Ho	<0.02	9	<0.2	Ca	20.02	30
ca h	W	<0.02	4L	402	Se	<0.02	P	<0.02	Z	<0.02		20.02	111	10.02	5		2	5	7
South and a second second second	and a second	「「ない」というないである										222	1 311	20 02	DV	20.02	Cd	<0.02	AI
	No. of Concession, name		and the second se										Stratic Stra		Constant and	and the second second	State States		
						Ja/mL)	40 (L	by ICP-I	TION	vernica	cais	I ACE IVIE							T
A REAL PROPERTY AND A REAL		And the second se	and the second se				5	5		Shin h	+>))		_						

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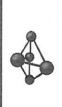
Part # 58139 Lot # 052521

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	rds, Inc.		VV.	in Solg	rtified Rel	erence Mater R ປ (2/09	erial CRM	(Bb)	•		AN/ AR-	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Accredited e Number lards.com
CERTIFIED WEIGHT REPORT: Part Loi	<u>ORT:</u> Part Number: Lot Number: Description:	<u>57116</u> 011421 Sulfur (S)			Solvent:	Lot # 011421	ASTM Type 1 Water	~	H		J.		
Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below was	Expiration Date: 011424 Recommended Storage: Ambient (2 I Concentration (µg/mL): 10000 NIST Test Number: 23060 Weight shown below was diluted to (mL):	011424 Ambient (20 °C) 10000 23060 Iluted to (mL): 19	°C) 1999.53	5E-05 Balan 0.100 Flask	5E-05 Balance Uncertainty 0.100 Flask Uncertainty				Formulated By:	. \$	Lawrence Barry	011421	
Compound	×	1	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty Assay Purity (%) (%)	Target Weight (g)	Actual Weight (g) Co	Actual (Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	(Solvent CAS# 05	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD5(ion ttached pg.) LD50	NIST SRM
1. Ammonium sulfate (S)		IN117 SLBF9912V	10000.0	0.66	0.10 24.3	83.2191	83.2206	10000.2	20.2 77	7783-20-2	NA	NA	3181
	[1] Spectrum No.1	-	4.004 se	oc]:581	24.004 sec]:58116.D# [Count] [Linear]	unt] [Line	ar]						
5000				an design of the sector of the sector of									
1000													an Margan Alla China Manana di Ayan Sara Pan
~-z/ш	10	20	30		40	50	60	70	80		06	100	
с. ОЕС													
2.5E5													
m/z-> 2.0E5	110	120	130	0	140	150	160	170	180		190	20-00 20-00	
1.065													
~-z/w	210	220	230		240	250	260						
Part # 57116 Lot	Lot # 011421					1 of 2				Printed:	Printed: 12/8/2021, 12:58:35 PM	:58:35 PM]

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





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

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

ALC: MAR												States and				and and			
N	<0.02	3	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Fr	<0.02	Se	<0.2	Tb	<0.02	M	<0.02
Sb	<0.02	J	<0.2	山	<0.02	Ho	* <0.02	Ξ.	<0.02	q	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	n	<0.02
As	<02	ප	<0.02	B	<0.02	In	<0.02	Mg	10.0>	ő	<0.02	Rh	<0.02	Ag	<0.02	F	<0.02	>	<0.02
Ba	<0.02	ර	<0.02	Gd	<0.02	Ц	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<02	Th	<0.02	Yb	<0.02
Be	10.0≻	പ്	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	d,	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	ප	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Ł	<0.02	Sm	<0.02	s	T	Sn	<0.02	Zn	<0.02
B	<0.02	ð	<0.02	Au	<0.02	Pb	<0.02	PN	<0.02	К	<0.2	Sc	<0.02	Ta	<0.02	Τī	<0.02	Zr	<0.02
Bi B	<0.02	රි ටි	<0.02	Ge Au	<0.02	P La	<0.02	oW	<0.02	κ z	<0.02	e S S	40.02 40.02	s e	T <0.02		I S F	Sn <0.02	

Physical Characterization:

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

Certified by:

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

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

* All standard containers are meticulously cleaned prior to use.

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

* 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).

Lot # 011421 Part # 57116

Printed: 12/8/2021, 12:58:35 PM

2 of 2

1 of 2

Printed: 12/8/2021, 12:58:34 PM

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



Certified Reference Material CRM



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

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

							ITACE MI	erais	Verifica	ITION	by ICP-N	12 (F	g/mL)						
P	40.02	8	40.02	ער	a a	Luf													
2		2	70.05	Uy	<0.02	Hf	<0.02	5	<0.02	Z	×0.02	Ŗ	000	?	202	1	2023		
Sb	<0.02	ß	<0.2	म	3	Ę	3	•	2				10.04	5	702	10	20.02	×	<0.02
	2			1	10.04	110	70.02	Lu	<0.02	Nb	<0.02	Re	40.02	s	2003	7	33	11	5
AS	202	ູລ	<0.02	Eu	40.02	5	2003	Ma		>		!		1			7000	c	20.02
D ,	3	>					10.01	ATAT .	TO:ON	Ş	20.02	Kh	<0.02	Ag	40.02	1	60.02	<	23
Na	10.02	S	20.02	Ga	-0.02	ŀ	4003	Mn	33	P	5	2	2						10.04
Re	10	ç	5	>				TTAT	70.02	70	<0.02	Kb	<0.02	Na	4012	7	40.02	\$	2002
-	TOOL	2	20.02	Ua	<0.02	Fe	012	Hg	40.2	σ	-1	0.	3	·.		1		1	
Bi	<0.02	3	5002	5	3	-	2			•		N	<0.02	y	20.02	Im	<0.02	Y	<0.02
1		1	TO ALL	ç	10.02	14	20.02	Mo	40.02	Pt	40.02	S	33	0	3	2	~	1	
8	<0.02	Cu	<0.02	Au	0.03	Ŗ	3	H	3	v					70.02	IIC	20.02	LIN	20.02
							70.02	TAG	20.02	~	<0.2	Sc	<0.02	Ta	40.02	T	A0.02	27	5002

(T)= Target analyte

Physical Characterization:

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

In 1. She

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 57115 Lot # 032921



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.
 - **<u>CAUTION</u>**: 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: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

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

Page 1 of 2

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



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



ICSA

M5126

M5127

M5128

M5129

M5130

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.	"CERTIFIE			ERENCE CH	IECK SAMPL CSB-0710	E ICP-AES IO	CSA-1211,
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)
AI	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
Са	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

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.

m/z->	5.0E7	m/z-≻ 1.0E8	5.0E7	m/z->	N.5E0	5.0E6	1. Manganese(II) nitrate tetrahydrate (Mn)	Compound	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Volume shown below v	<u>CERTIFIED WEIGHT REPORT:</u> Pa L	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
210		110		10		[1] Spectrum No.1		7	Expiration Date: 060125 Recommended Storage: Ambient (2 I Concentration (µg/mL): 1000 NIST Test Number: 6UTB Volume shown below was diluted to (mL):	<u>ar:</u> Part Number: Lot Number: Description:	s, Inc.
						n No.	58125	Part Number	c 7 1 1 1	1210107	
220		120		20			021022	Lot Number	060125 Ambient (20 °C) 1000 6UTB 6UTB	<u>58025</u> 060122 Manganese (Mn)	¥
230		130		30		4.243 se	0.1000	Dilution Factor	°C) 3000.41		
U		Ŭ				əc]:570	300.0	lnitial Vol. (mL)	5E-05	MS	0
240		140		6		025.D# [0	0.084	V.V.DO riask Uncertainty Initial Uncertainty Vol. (mL) Pipette (mL)	Balance Uncertainty	M2184	ertified R
250		150		50		[34.243 sec]:57025.D# [Count] [Linear]	1000	Nominal Conc. (µg/mL)	2.0%	Lot # 20510011	eference
260		160		00		inear]	10000.5	Initial) Conc. (µg/mL	60.0 (mL)	Solvent: Nitric Acid	Certified Reference Material CRM
•		170		70			1000.0	Final) Conc. (µg/mL)	Nitric Acid		R :
							2.1	Expanded Uncertainty +/- (µg/mL)	Formulated By:	Q.	61212
		180		80			20694-39-7	(Solve) CAS#		Germa	Ň
		190		0			7 5 mg/m3	0 7	Lawrence Barry	(fr	
		200		100				SDS Information Safety Info. On Attacl SHA PEL (TWA)	Rentas	Y	ANAB IS AR-153 https://Ab
		-					orl-rat >300mg/kg	hed pg.) LD50	060122 060122		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
							ig 3132	NIST		<u> </u>	Accredite te Numbe dards.cor

Part # 58025 Lot # 060122

1 of 2

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Certified Reference Material CRM



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

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

							Trace Me	etals	Verifica	tion	by ICP-N	IS (LI	g/mL)						
	3	2	3	2	2	Цf	3		3	K.	3	7	A M	ŝ	3	7	400	¥	4000
A	<0.02	8	<0.02	Dy	<0.02	Hf	<0.02	5	<0.02	Z	<0.02	P	<0.02	Se	40.2	9	<0.02	W	<0.02
Sp	<0.02	ß	40.2	Ę	<0.02	Но	<0.02	Լո	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	С	<0.02
As	<0.2	S	<0.02	臣	<0.02	Б	<0.02	Mg	10.0>	S0	<0.02	Rh	<0.02	Ag	<0.02	T	<0.02	<	<0.02
Ba	<0.02	ູ	<0.02	Gd	<0.02	г	<0.02	Mn	Т	Pd	<0.02	Rb	<0.02	Na	<0.2	Ţ	<0.02	ΥЪ	<0.02
Be	<0.01	Ω	<0.02	Ga	<0.02	Fe	40.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	S	<0.02	Ge	<0.02	5	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	<0.02
в	<0.02	Q	<0.02	Au	<0.02	РЬ	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	T	<0.02	Zr	<0.02

(T)= Target analyte

Physical Characterization:

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

In P. S.

Certified by:

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

the 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).

NR181

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m/z->	1.0E6	2.0E6	m/z->	1000	2000	1.0E5	2.0E5	1. Ammonium molybdate (Mo)	Compound	Volume show	NIST Tes	Recommended Storage: Nominal Concentration (µg/mL):	Expire	Part Lot Des	CERTIFIED WEIGHT REPORT:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
210			110		đ		[1] Spectrum No.1		Nur	vn below was o	NIST Test Number:	d Storage: n (µg/mL):	Expiration Date:	Part Number: Lot Number: Description:		s, Inc.
2			120		N		No.1	58142 022222	Part Lot Number Number	Volume shown below was diluted to (mL):	6UTB	Ambient (20 °C) 1000	051725	57042 051722 Molybde		-
							[8.594	0.1000	Dilution Factor	3000.41		20 °C)		<u>57042</u> <u>051722</u> Molybdenum (Mo)		
			130		G		sec]:5704	300.0	Initial Un Vol. (mL) Pip	0.058 Flas	5E-05 Bala					M.S.
			140		40 0		8.594 sec]:57042.D# [Count] [Linear]	0.084	Uncertainty N Pipette (mL) Conc	Flask Uncertainty	Balance Uncertainty			MKE	_	Certified Rep M.5192
			150		50		unt] [Líne	1000	Nominal Conc. (µg/mL) Co				0.5%	MKBQ8597V Am	Lot #	ference M.
			160		60)ar]	10001.0	Initial Conc. (µg/mL) C				15.0 » (mL)	Ammonium hydroxide		Certified Reference Material CRM いちいのえいたいのんりはてい
			170		70			1000.0	Final Conc. (µg/mL)	Г			Ammonium hydroxide	æ	-	M 172
								2.1	Expanded Uncertainty +/- (µg/mL)		Reviewed By:	N's	Formulated By:	A		
			180		80			13106-76-8	(Solve CAS#			to I		deronce		•
			190		90			5 mg(Mo)/m3	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		Pedro L. Rentas	era	Lawrence Barry	An		nt 、
			200		100			13 orl-rat 333 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50		s 051722	/	rry 051722	Ψ		ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
								kg 3134	NIST		722		722			4 Accredite ate Numbe ndards.com

Part # 57042 Lot # 051722

1 of 2

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	Inc



Certified Reference Material CRM



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

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

							Trace M	letals	Verifica	ition	by ICP-N	IS (µ	g/mL)						
A	<0.02	ß	40.02	Dv	20.02	Ηŕ	3	1		1									
SP SP	A).02	Ĵ,	2.0	7 5	10.02	1	<0.02	' E	20.02	N	<0.02	P	<0.02	Se	<0.2	4L	<0.02	W	<0.02
<u>,</u>		2	10.2	5	20.02	Ho	<0.02	Lu	<0.02	ß	<0.02	Re	<0.02	Si	40.02	5	<0.02	11	4000
2	202	ŝ	20.02	E	<0.02	h	<0.02	Mg	<0.01	ò	<007	Rh	50	۸,	2003	3	3	: (
Ba	40.02	S	<0.02	2	300	7	3	ξ,	2	2			10.02	26	70.02		20.02	<	20.02
Be	5	?	3	2	20.02	l =	70.02	UTAT	20.02	Pd	<0.02	Rb	<0.02	Na	40.2	Ъ	<0.02	ΥЪ	<0.02
	-	2	70.02	Ca	<0.02	He	<02	Hg	40.2	P	<0.02	Ru	<0.02	S	40.02	J	2002	<	2003
Id	20.02	6	40.02	ଜ	<0.02	5	40.02	Mo	÷	¥	2003	ŝ	202	0	5	>		1,	10104
ω	40.02	6	<0.02	An	3	ş	3	E		; ;	TO'NE	UH	70.02	0	20.05	Sn	20.02	5	<0.02
					10.01	0.1	20.05	ING	20.02	~	40.2	Sc	<0.02	Ta	<0.02	Т	<0.02	72	<0.02
																			Non- Non- of Concession, Name of Concession, N

(T)= Target analyte

Physical Characterization:

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

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Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 57042 Lot # 051722

m/z->	N.5E6	m/z-> 5.0E6	2.5E6	m/z->	N 5 10 5	5.0E5	1. Sodium nitrate (Na)	Compound	B00-368-1131 WWW.absolutestandards.com CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Weight shown below wa	Absolute Standards, Inc.
210		1 10		10		[1] Spectrum No.1	INC	R	itandards.com	s, Inc.
220		120		NO		No.1	IN036 NAV01201511	Lot RM# Number	58111 092121 Sodium (Na) 092124 Ambient (20 °C) 10000 6UTB Iuted to (mL): 30	
230	ä	130		a o		8.935 sec	10000 9	Nominal F Conc. (µg/mL)	0000.41	
240		140		40]:58111.D#	99.999 0.10	Purity Uncertainty (%) Purity (%)	Certified Re Solvent 2% 5E-05 Balance Uncertainty 0.058 Flask Uncertainty	
250		150		თ O		8.935 sec]:58111.D# [Count] [Linear]	27.0 111.1274	Assay Target (%) Weight (g)	Certified Reference Material CRM	
260		160		0		near]	74 111.1433	t Actual (g) Weight (g)	Material CRI	
		170		70				Actual (Conc. (µg/mL))
		180		80			General Content	Expanded Uncertainty +/- (µg/mL) C	Formulated By: Reviewed By:	
		190		80			7631-99-4 5	Solvent Saf CAS# OSH/		D
							5 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LDS(Giovanni Esposito	ΔΝΔ
		00		100			orl-rat 3236 mg/kg	on tached pg.) LD50	AR-1539 Certificate Number https://Absolutestandards.com	ANAR ISO 1703/ Accredited
- M							0	NIST		Annonliton

Part # 58111 Lot # 092121

1 of 2

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	Inc.



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

							Trace M	etals	Verifica	ition	by ICP-N	H) SI	g/mL)						
	200																		
A	<0.02	8	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	40.2	41	40.02	W	<0.02
Sb	<0.02	G	<0.2	막	<0.02	Но	<0.02	Ľ	<0.02	Nb	<0.02	Re	<0.02	S	<0.02	Te	<0.02	C	<0.02
As	<0.2	S	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	SO	<0.02	Rh	<0.02	Ag	<0.02	Н	<0.02	V	<0.02
Ba	<0.02	S	<0.02	Gd	<0.02	١٢	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	T	Ц	<0.02	YЪ	<0.02
Be	<0.01	ç	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	S	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Z	<0.02
u.	<0.02	6	<0.02	Au	<0.02	Рb	<0.02	Nd	<0.02	ĸ	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02
													Contraction of the local division of the loc	State of the second		Contraction of the local division of the loc			

Physical Characterization:

(T)= Target analyte

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 58111 Lot # 092121



Certificate of Analysis

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

130925

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Ti

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

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ICP Assay

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

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

3162a

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

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

11.2 Lot Expiration Date

- November 02, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



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.
 - **<u>CAUTION</u>**: 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: AI, Ca, Fe, and Mg. The ICSB solution contains the analytes: Ag, As, Sb, Ba, Be,

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

Page 1 of 2

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



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



ICSA

M5126

M5127

M5128

M5129

M5130

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.

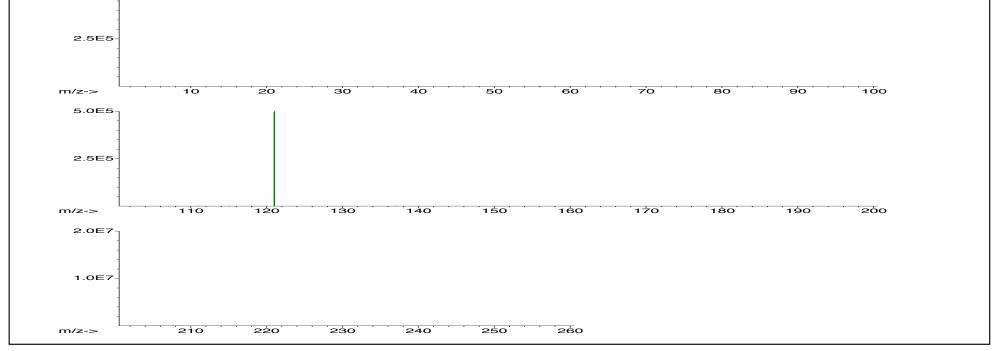
(D) "CERTIFIED VALUE" CONCENTRATIONS OF QATS ICP-AES ICS SOLUTION(S)

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.	"CERTIFIE			ERENCE CH	IECK SAMPL CSB-0710	E ICP-AES IO	CSA-1211,
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)
AI	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
Са	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

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.

0-368-1131 w.absolutestandards.com				C	Certified I	Reference l	Material CF	RM				-1539 Certificate ://Absolutestand	
RTIFIED WEIGHT REPORT:						Lot #	Solvent:						_
Part Number:		<u>57051</u>				20370011	Nitric Acid		s.		(to		
Lot Number:		<u>101521</u>	(Ch)						Aiov	inne i	Esposito		
Description:		Antimony	<u>(30)</u>			2.0%	40.0	Nitric Acid	Formulated By		Giovanni Esposito	101521	-
Expiration Date:	:	101524				2.070	(mL)	Nitrie Acia	I officiated D	y.		101321	
Recommended Storage:		Ambient (20	°C)				()				P		
Nominal Concentration (µg/mL):	l.	1000							fla	6 /	lento		
NIST Test Number:		6UTB		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	101521	
Volume shown below v	vas dilute	ed to (mL):	2000.25	0.116	Flask Uncertair	nty							_
									Expanded		SDS Informa	tion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	ent Safety Info. On	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
. Antimony (Sb)	58151	081820	0.1000	200.0	0.084	1000	10001.5	1000.0	2.2	7440-36-0	0.5 mg/m3	orl-rat 7000 mg/kg	3102
[1] Spect			17 964 4		 051 D# [[Count] [Li	nearl						
[1] opect		J. L			JO 1.D // [0000111][[2]							





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	Т	Ca	< 0.2	Er	<0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Те	< 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	Р	< 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	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	Κ	<0.2	Sc	<0.02	Та	< 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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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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	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	022822 022822 022822 022822 022822 022822 022822		
	ANA AR- https:	Europeate Giovanni Esposito Giovanni Esposito Pedro L. Rentas Pedro L. Rentas Pedro L. Rentas (Solvent Safety Info. On Attached pg.) (Solvent Safety Info. On Attached pg.) (S	8	D D -
		CASi CASi	Q	D D T
22/05/50:	Ð	Exp Form	2	
140 3	W	Nitric Acid Final Conc. (ug/mL) 1000.0		
K	Material CR	Solvent: Nitric Acid 40.0 (mL) (mL) Initial Conc. (<i>ug/m</i> L) 10000.1		
	ference	Lot # 20370011 2.0% 2.0% by Nominal Conc. (µg/mL) 1000		4 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	いちひん Certified Reference Material CRM	2C Balance Uncertainty Flask Uncertainty Uncertainty 0.084	33.422 sed]:58029.D# [Count] [Lnear]	с 0 0 0 0
	grz	5E-05 0.058 Initial Vol. (mL) 200.0		2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	MA	U C) 2000.02 Dilution Factor 0.1000	0 0 1 0	
2		58029 58029 022822 022822 Copper (Cu) 001 Ambient (20 °C) 1000 Bac diluted to (mL): 20 Part Lot 2 Number Number 1	S S	2 2 0 1 0
	, Inc.	IT REPORT: 58029 Part Number: 58029 Lot Number: 022822 Description: 022825 Expiration Date: 022825 ecommended Storage: Ambient (20 Concentration (µg/mL): 1000 NIST Test Number: 6UTB Volume shown below was diluted to (mL): Part Inder Number Aumber Number Aumber 000 Nolume shown below was diluted to (mL): Number Inter Number Inter Number	10 To	0 10 0
	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Volume shown below w Compound 1. Copper(II) nitrate trihydrate (Cu)	1.0E 3.0E 2.5 2.5 1.0E 3.0E 2.5 1.0E 1.0	2.0E7

Part # 58029 Lot # 022822

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1 of 2

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www.absolutestandards.com	800-368-1131	Absolute Standards, Inc.
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ertified Reference Material CRM



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

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

							Trace M	Metals	Verificat	tion	by ICP-N	IL) SI	g/mL)				-		
									A North Contraction			and a second						No. of Concession, Name	
AI	< 0.02	Cd	<0.02	Dy	< 0.02	Hf	<0.02	Li	< 0.02	N	<0.02	Pr	<0.02	Se	<0.2	Ть	<0.02	¥	<0.02
Sp	<0.02	Ca	<0.2	F	< 0.02	Ho	<0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	<0.02	Te	<0.02	U	<0.02
As	< 0.2	Ce	< 0.02	Eu	<0.02	In	<0.02	Mg	< 0.01	Os	< 0.02	Rh	< 0.02	Ag	<0.02	T	<0.02	<	<0.02
Ba	< 0.02	Cs	<0.02	Gd	<0.02	lr	<0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	<0.2	Th	<0.02	Yь	<0.02
Be	< 0.01	Cr	<0.02	Ga	< 0.02	Fe	<0.2	Hg	<0.2	Р	< 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	Т	Au	<0.02	Рь	<0.02	Nd	<0.02	ĸ	<0.2	Sc	< 0.02	Ta	<0.02	Ti	< 0.02	Zr	< 0.02
									(T) - Target applied	analyta									

(T)= Target analyte

Physical Characterization:

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

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Certified by:

- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.
- * All standard containers are meticulously cleaned prior to use.
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).
- Part # 58029

OCERTIFIED WEIGHT REPORT: CERTIFIED WEIGHT REPORT: CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Lot Number: Lot Number: Valuadium Description: Valuadium Notional Concentration (ug/mL): Notional Concentration (ug/mL): Volume chorent chorent chorent chorent colspan=	57023		č	of Deliver	1	CO Joinetek			4	AP	ANAB ISO 17034 Accredited	Accredited
CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description: Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number:	57023		C.	runea He	terence l	Certified Reference Material CHM		EF)		http:	AR-1539 Certificate Number https://Absolutestandards.com	te Numbe dards.com
Expiration Date: Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Volume shown bolow wee	<u>100121</u> Vanadium (V)	s		5	Lot # 20370011	Solvent: Nitric Acid	L	Hierannie	nni E	aperto		
Nominal Concentration (Jg/mL): NIST Test Number: Volume shown holow was	100124 Ambient (20 °C)	1 0			2.0%	60.0 (mL)	Nitric Acid	Formulated By:	4	Giovanni Esposito	100121	
A DIALITE SHOWIN DELOW WAS	6UTB 6UTB diluted to (mL):	3000.4	5E-05 B 0.06 F	Balance Uncertainty Flask Uncertainty	×			Reviewed By:		Pedro L. Rentas	100121	
Compound	Part Lot Number Number			Uncertainty Pipette (mL) Co	ν Nominal Conc. (μg/mL)	Initial Conc. (µg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	(Solve CAS#	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50	ation Attached pg.) LD50	NIST
1. Ammonium Metavanadate (V) 58	58123 070721	0.1000	300.0	0.084	1000		1000.0	2.1	7803-55-6	1.0 mg/m3	orl-rat 630 mg/kg	3165
2.0E6	-	4.243 se	c]:5802	34.243 sec]:58023.D# [Count] [Linear]	Inne ILL	iear]	۵.					
1.0E6-												
m/2-> 10	20	0		40	20	80	20	W	08	06	100	
1.0E												
m/z->	120	130		140	150	160	170		180	190	200	
, с Ш 25 0												
m/z-> 210	220	230		240	250	260						

Part # 57023 Lot # 100121

1 of 2

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





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

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

							Trace N	Aetals	S Verification by	tion	by ICP-M	IS (U	g/mL)		and the second second				
																	Sam Providence - An		A lot of the subscription of the subscription of
_	<0.02	Cd	<0.02	Dy	<0.02	JH	<0.02	L:	<0.02	ï	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	M	<0.02
~	<0.02	Ca	<0.2	Er	<0.02	Ho	<0.02	Lu	<0.02	ЧN	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	n	<0.02
	<0.2	ပိ	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	IT	<0.02	>	F
_	<0.02	Cs	<0.02	Gd	<0.02	Ц	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	ΥР	<0.02
	<0.01	ŋ	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Д	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	2	20.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Ł	<0.02	Sm	<0.02	s	<0.02	Sn S	20.02	7"	70.02
	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	PN	<0.02	Х	<0.2	Sc	<0.02	, Ta	<0.02	Ę	20.02	7,	20.02
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Physical Characterization:

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

Certified by:

Sar P.

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT:	Part Number: Lot Number:	Evolution Date:	Recommended Storage:	Nominal Concentration (µg/mL):	NIST Test Number:	Volume shown i	Compound	1. Strontium nitrate (Sr)	2.066	1.006	m/z->	5.0E7	m∕z-> 1.0E8	S.0E7	m/z->
- B							Volume shown below was diluted to (mL):	Part L	1 1	[1] Spectrum No.1		10		110		210
•				ient (200 °C)		ω	(mL): 3000.41	Lot Dilution				20 30		120 130	9	220 230
Certified						5E-05 Balance Uncertainty	0.058 Flask Uncertainty	Initial Uncertainty Nominal	300.0 0.084	33.272 sec]:57038.D# [Count] [Linear]		4 0		0 4 1 0		0 240
Certified Reference Material CRM	Lot # S	20370011 N	2.0%			ertainty	ainty			38.D# [Cour		SO		150		250
Material CRM 2 。o子/oく /))	Solvent:	Nitric Acid	60.0 Nitric Acid	(mL)				Initial Final	10000.1 1000.0	nt] [Linear]		6 0		160		260
R		Hiovannie	- T		h	Reviewed By:			2.1			70 80		170 180		
P		8		S	4 ten	Pedro L	222	(Solvent Safet)				9		0 1 90		
ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com		reater.	Giovanni Esposito 073021		ø	Pedro L. Rentas 073021		(Solvent Safety Info. On Attached pg.)	NA orl-rat 2750mg/kg			100		200		
Accreditec ate Number Idards.com			151			2		NIST								

Part # 57038 Lot # 073021

1 of 2

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Certified Reference Material CRM



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

A	40.02	8	40.02	Dy	40.02	록	Trace M	etals		ation	by ICP-N	IS (µ)	g/mL)	2		-10 1		
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ም		5 1			0.04	5	<0.02	MIN	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2		Ц	Th <0.02
1	10.01	2	20.05	Ua	40.02	Fe	<0.2	Hg	40.2	q	<0.02	Ru	<0.02	Sr	Ţ		T m	Tm ANN
BI	<0.02	Co	<0.02	Ge	40.02	La	40.02	M	300	₽	3	2	3	2			2	
B	<0.02	0	003	An	 3	Ŗ	3			: :	10.02	JIII	20.02	v	20.02		Sn	Sn <0.02
					70.02	10	20.02	ING	<0.02	~	40.2	Sc	<0.02	Ta	<0.02		Ti	Ti <0.02

(T)= Target analyte

Physical Characterization:

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

Son P. S.

Certified by:

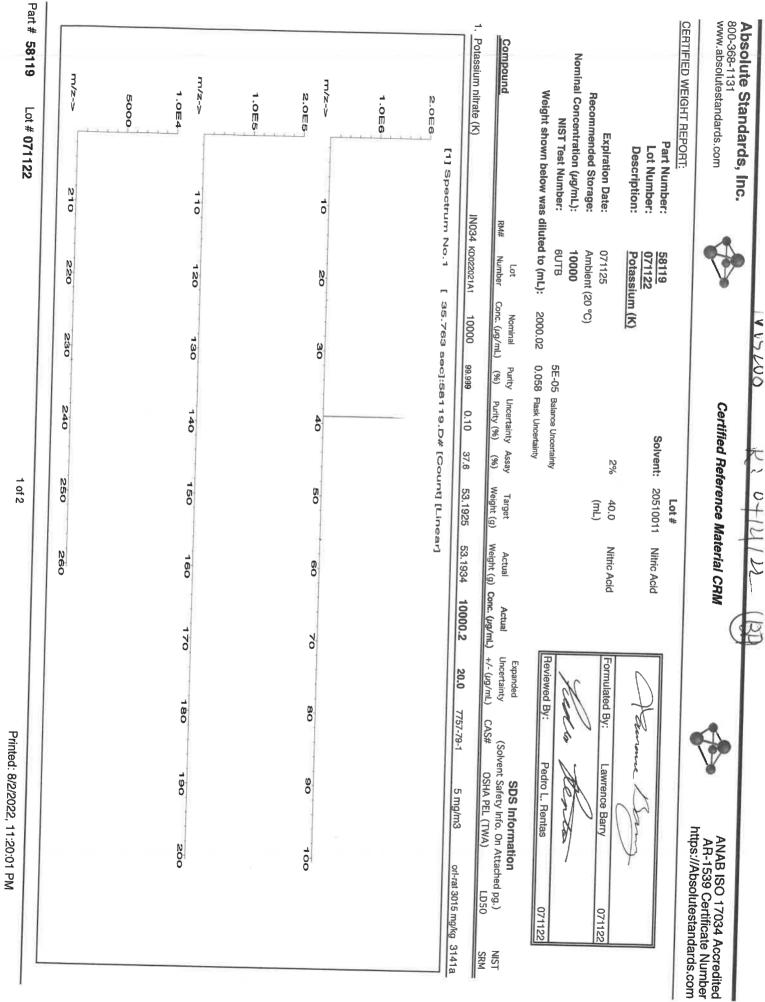
* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

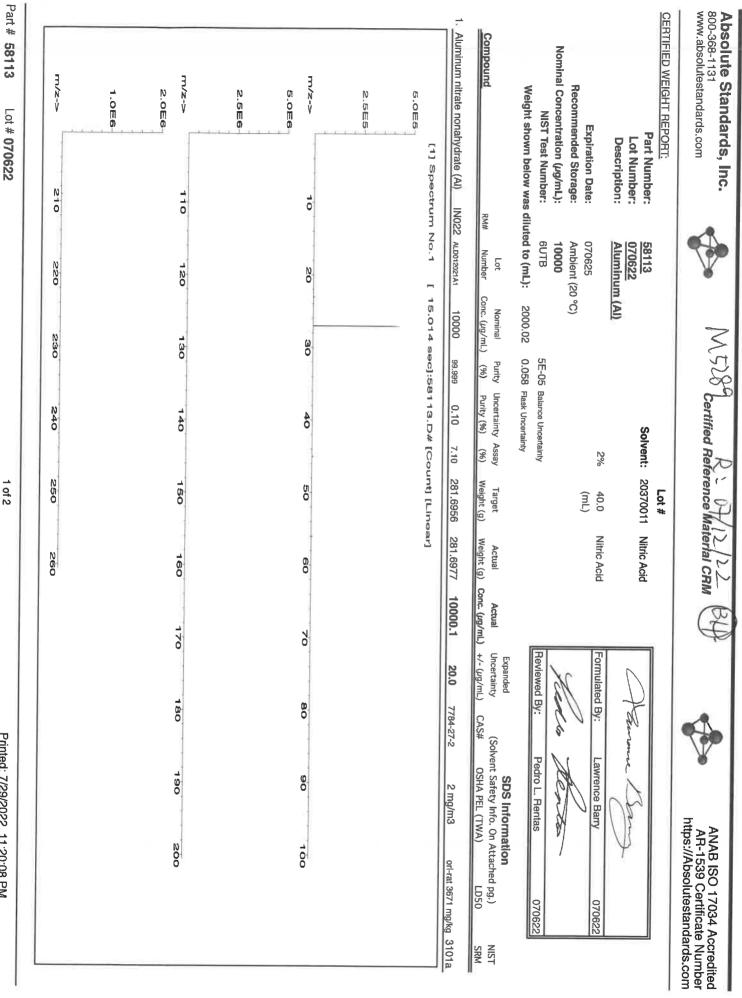
* Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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



1 of 2

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	Certified Reference Material CRM	*	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com
Instrumental Analysis by Indu	Mass Spec		
<0.02	Trace Metals V		
40.02 40.02 40.02 Ca 40.02 Ca	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	<0.2	W <0.02
Physical Characterization:	(T)= Target analyte		1 10.02
Homogeneity: No heterogeneity was ob	Homogeneity: No heterogeneity was observed in the preparation of this standard.	Ce	Certified by:
		()	sold and a
	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	ated. ed in	
 Standards are prepared gravimetriculously cleaned prior to use. Standards are certifed (+/-) 0.5% of the stated value, unless All standards should be stored with caps tight and under apping the uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelin Measurement Result," NIST Technical Note 1297, U.S. Govern 	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 1305		
	This is the second		
	D.C. (1994).		



1 of 2

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	Inc.
	800-368-1131



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

							race Me	etais	Verifica	ation	by ICP-	MC (hg/mr)						
							-01110-												
Al	Т	G	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	77	<0.02	Se	<0.2	Ъ	<0.02	W	<u>6</u> .0
Sр	<0.02	ß	<0.2	막	<0.02	Но	<0.02	Ŀ	<0.02	Nb	<0.02	Re	<0.02	ŝ	<0.02	Te	40.02		<0.02
As	<0.2	င့	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	^S 0	<0.02	Rh	<0.02	Ag	<0.02		40.02	V	4
Ba	<0.02	ß	<0.02	Gd	<0.02	١r	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Þ	<0.02	Υ γ	4
Be	<0.01	Ω	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	ş	40.02	Jm	40.02	¥	
B:	<0.02	S	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	₽	<0.02	Sm	<0.02	s	<0.02	2	<0.02	7	4
B	<0.02	С ¹	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	×	<0.2	Ş	<0.02	Ta	<0.02	Ţ.	<0.02	27	A)

Physical Characterization:

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

(T)= Target analyte

Certified by:

In P. Mr.

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QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R : 以120 2 [

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

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

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

> Safety Data Sheets Available Upon Request



(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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

RMs ICV 1, 5, 6 SFAM.docx

Page 1 of 2

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



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



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

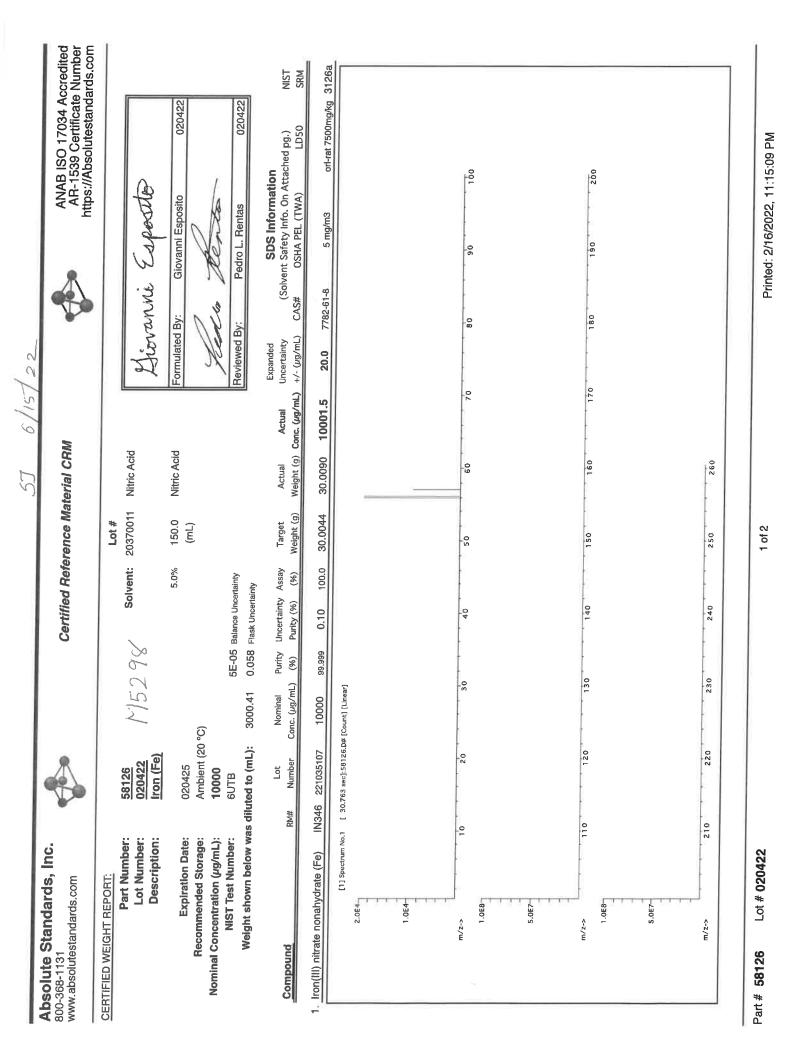
AP11MInstructions for QATS Reference Material: Inorganic ICV SolutionsICV1-1014For ICP-MS analysis, use a 50-fold dilution by pipetting 2 mL of the ICV1 concentrate
into a 100 mL volumetric flask and dilute to volume with 1% (v/v) nitric acid.ICV5-0415For the cold vapor analysis of mercury by AA, use 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.ICV6-0400For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6
concentrate into a 100 mL volumetric flask and dilute to volume with Type II water.
Distill this solution along with the samples before analysis. The cyanide concentrate
is prepared from K3Fe(CN)6, Type II water, and 0.1 % sodium hydroxide, and will
decompose rapidly if exposed to light.

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

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

	ICV1-1014	
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (µg/L) (after 50-fold dilution)
AI	2500	500
Sb	1000	200
As	1000	200
Ba	520	100
Be	510	100
Cd	510	100
Ca	10000	2000
Cr	520	100
Co	520	100
Cu	510	100
Fe	10000	2000
Pb	1000	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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AR-1539 Certificate Number https://Absolutestandards.com ANAB ISO 17034 Accredited

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

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C					20.02	5	<0.02	٩Ŋ	<0.02	ß	<0.02	33	<0.02	f	2002	11	ç
e S				In	<0.02	Ма	10.07	ć	000	ā				2	70.02	>	20.02
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3				4	<0.02	Mn	<0.10	Ъd	<0.07	٩d	2007	, LA		i			5.54
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Physical Characterization:

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

Certified by:

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- * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. the preparation of all standards.
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Ex Recomme Nominal Concentry Weight sho 2.0E6 m/z-> 2.0E5 1.0E5 5.0E5 2.5E6	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT: Part Number: Lot Number:
Expiration Date: 072125 2% 40.0 Nitric Addi nanded Storage: Ambient (20 °C) fml) 5E-05 Baaroe Uncertainy fml) fml) ST Test Number: fml) SE-05 Baaroe Uncertainy fml) fml) SE-05 Baaroe Uncertainy SE-05 Baaroe Uncertainy fml) fml) SE-05 Baaroe Uncertainy SE-05 Baaroe Uncertainy Actual Number: fml) Winght (a) Winght (b) Wingh	Part Number: Lot Number: Description:
NIST Test Number: 6UTB 5E-D5 Bainone Uncertainty Nominal Purity Uncertainty Actual Barlum nitrate (Ba) IN023 N0022 0.0058 Fast Uncertainty Actual 1.0EE6 I11 Spectrum No.1 [112.514 see]:65156.0.# Country (N) (N) Weight (Q) 1.0EE6 I11 Spectrum No.1 [12.514 see]:65156.0.# Count [Linean] 2.0EE6 I10 20 30 40 sio eo 1.0EE6 I 10 20 30 40 sio eo 2.0EE5 10 20 30 40 sio eo sio eo 2.0EE5 10 120 130 140 150 160 eo soccea 1.0 120 130 140 150 160 soccea 1.0 1.20 1.30 1.40 150 160 soccea 1.5 1.5 1.50 <td< th=""><th>Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):</th></td<>	Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):
Compound New Number Core: (ug/mk) (%) Pairty (%) (%) Weight (%) <td>Weight shown below was :</td>	Weight shown below was :
III Spectrum No.1 [12.514 sec]:58158.D# [Count] [Linear] III 10 20 30 40 50 III 10 120 190 140 150 III 120 190 140 150 III 120 190 140 150 III 120 190 140 150	
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	Part # 57056 Lot # 072122

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

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Physical Characterization:

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

Certified by:

ar R

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

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

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



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

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

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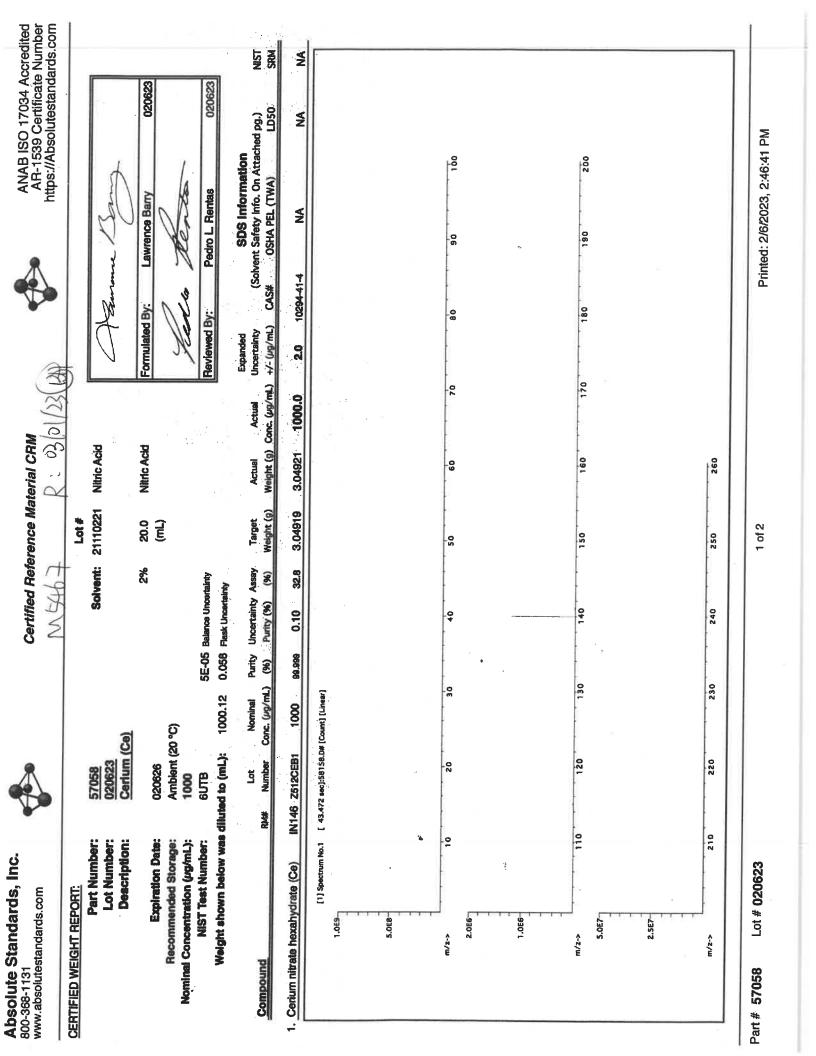
Physical Characterization:

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

Certified by:

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Lot # 070622 Part # 57103



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



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

	402 Tb 4002 W	Si <0.02 Te <0.02 U <0.02	<0.02 TI <0.02 V	<02 Th <0.02 Yb	<0.02 Tm <0.02 Y	<0.02 Sn <0.02 Zn	<0.02 Ti <0.02 Zr
/mr)	<0.02	<0.02	<0.02	20:02	≪0.02	<0.02	<0.02
Br) o	4	Re	Rh	Rb	Ru	Sm	8
V ILP-MS	€0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<02
	iù	qN	0s	ЪЧ	2	揻	ж
ventication by I	<0.02	<0.02	<0.01	<0.02	⊲02	<0.02	<0.02
Metals	n	Lu	Mg	Mn	Hg	Mo	PN
I Face Me	<0.02	<0.02	<0.02	<0.02	402	<0.02	<0.02
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	AI	Sb	As	Ba	Be	盗	12

(T)= Target analyte

Physical Characterization:

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

Certified by:

Ser P

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ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	031523	on tached pg.) NIST LD50 SRM	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5:15 PM
ANA AR-	Ped X Gio	SDS Information (Solvent Safety Info. On Attached pg.) COHA PEL (TWA) LD5C Contrast ->nnt		Printed: 3/16/2023, 1:45:15 PM
	Hioramui Formulated By: Reviewed By:	Expanded Uncertainty +/- (ug/mL) CAS: 20.0 471-34		- Li
170		Actual Actual Weight (g) Conc. (µg/mL) 75.2093 10001.4	ar] 60 70 260 170	
Certified Reference Material CRM	Lot # Solvent: 21110221 2% 60.0 (mL) Incertainty	ty Assay Target) (%) Weight (g) 38.9 75.1990	D* [Count] [Line 50 150 250	1 of 2
N15697 I	k Und	Nominal Purity Uncertainty Assay Conc. (µg/mL) (%) Purity (%) (%) 10000 99.999 0.10 39.9	12.514 sec]:68120.D# [Count] [Linear] 30 40 50 130 140 150 230 240 250	
	30(Ca)	Lot No RM# Number Conc. NO14 CAD072022A1 10		
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT: Part Number: 58120 Lot Number: 031523 Description: 031526 Expiration Date: 031526 Recommended Storage: Ambient (2 Nominal Concentration (<i>ug</i> /mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):	Compound 1. Calcium carbonate (Ca)	[1] Spectrum No.1 2.0E4 1.0E4 5.0E4 2.5E4 1.0E5 1.0E5 1.0E5 1.0E5 1.0E5 1.0E5 1.0E5 1.0E5 1.0E5 1.0E5 1.0E5	Part # 58120 Lot # 031523

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

Certified Reference Material CRM



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

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	40 12	ථ	40.02	a	40.02	h	<0.02	Mg	±0.01	ő	20 .0>	2	<0.02	Ag	<0.02	F	<0.02	>	<0.02
_	<0.02	ඊ	<0.02	3	40.02	놰	<0.02	Å	€0.02	æ	<0.02	å	<0.02	Na	<0.2	Ę	<0.02	ይ	40.02
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	≤0.02	გ	<u>60.02</u>	ප්	40.02	3	0.02	Mo	<0.02	æ	<0.02	Sn	<0.02	S	<0.02	Sn	<0.02	Ŋ	<0.02
	<0.02	ð	<u>60.05</u>	Au	000	£	<0.02	PN	<u>40.02</u>	Å	40.2	Sc	<0.02	T.	≤0.02	Ę	<0.02	Ň	2002

Physical Characterization:

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

Certified by:

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Part # 58120 Lot # 031523

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com			0	Certified Re	Certified Reference Material CRM	aterial CRI	R 103/17	12		AN/ AR- https:	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	Accredited ate Number ndards.com
CERTIFIED WEIGHT REPORT: Part Number: Lot Number: Description:	n: <u>57182</u> n: <u>061522</u> n: <u>Lead (Pb</u>)	-		Solvent:	Lot #	Nitric Acid		Lievannie	wie E	spectite		
Expiration Date:061525Recommended Storage:Ambient (2)Nominal Concentration (ug/mL):10000NIST Test Number:6UTBWeight shown below was diluted to (mL):	e: 061525 e: Ambient (20 °C) .): 10000 n: 6UTB vas diluted to (mL): 20	0 °C) 2000.02	5E-05 B 0.058 F	2% 5E-05 Balance Uncertainty 0.058 Flask Uncertainty	40.0 (mL)	Nitric Acid		Formulated By:	Cioval Pedro	Giovanni Esposito	0615/2	
Compound	Lot RM# : Number	Nominal Conc. (µg/mL)	Purity (%)	Uncertainty Assay Purity (%) (%)	y Target) Weight (g)	Actual Weight (g) (Actual Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL) CA	SI (Solvent Sa CAS# 0SH	SDS information (Solvent Safety Info. On Attached pg.) COHA PEL (TWA)	lon Attached pg.) LD50	LSIN NIST
1. Lead(II) nitrate (Pb)	IN029 PBD122016A1	10000	39.998	0.10 62.5	32.0006		10001.1		φ	0.05 ma/m3	introme-rat 83 mol/co	
[1] Speci	[1] Spectrum No.1	17.284 86	sc]:581	85.0*	17.284 sec]:58182.D# [Count] [Linear]	arj						11
ສ ອ ອ												_
2.0E6	20	OF		4	20	B	20	8	0	*	100	
1.0E6												
rn/z->	110	1 30		140	150	160	170	180	1 80		500	
ы С. С. Ш. С.												
K.	210 220	530		240	260	560						
Part # 57182 Lot # 061522					1 of 2				Printed: 3/	Printed: 3/16/2023, 1:45:32 PM	5:32 PM	1

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



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

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

F																	
	d <0.02	Ŋ	<0.02	Hf	<0.02	Li	<0.02	in in	<0.02	đ	4000	3	C.04	14	WWV		000
		d	000	14	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			1		:		2	10	10	70.02	*	70.02
_		đ	20.02	2		3	<0.02	q	<0.02	g	40.02	ŝ	<u>60.05</u>	Te	\$0.02	Ŋ	≤0.02
02 ₹07	` 	đ	<0.02	9	0.02	Mg	<0.01	ő	<0.02	4a	<0.02	Åø	2007	F	200	1	Ş
_	_	5	2007	1	200	1	000	i				9		17	70.02	>	70702
		3	70.70	4		UIW	20'02	P2	<0.02	2	40.02	Ra	5 9 9	đ	≤0.02	\$	20.02
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		5		ġ	<0.02	Wo	<0.02	Z .	<u>6</u> .62	SB	40.02	s	<0.02	Sn	<000>	Zn	2007
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							70.00	4	10	20	20.02	13		q	8.U2	3	808

Physical Characterization:

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

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Certified by:

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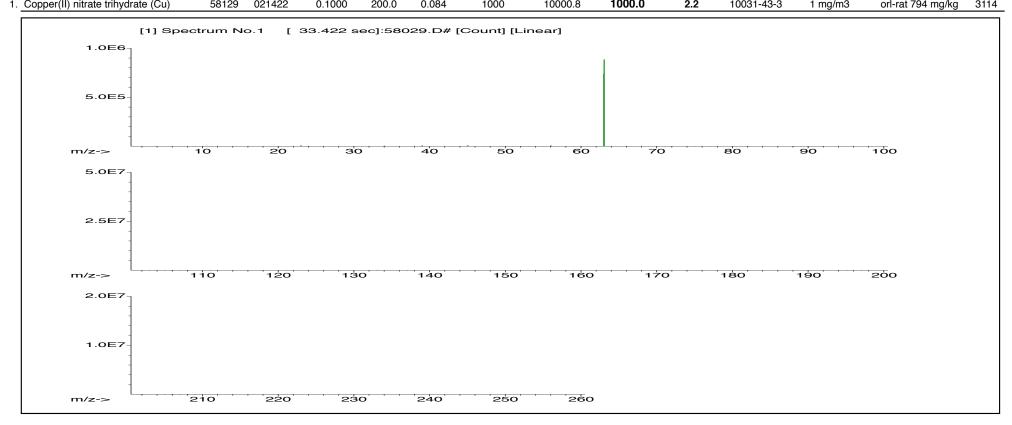
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Part # 57182 Lot # 061522

Description D-368-1131 w.absolutestandards.com	5			(Certified I	Reference	Material CF	RM			AR AR	AB ISO 17034 A -1539 Certificat ://Absolutestanc	e Nur
RTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Numbe	er:	<u>58029</u>				20510011	Nitric Acid			1 .			
Lot Numbe	er:	102622							Eu	\mathcal{A}	no gon		
Descriptio	n:	Copper (C	<u>u)</u>								0		
						2.0%	40.0	Nitric Acid	Formulated By		Eli Aliaga	102622	2
Expiration Dat	te:	102625					(mL)			,	\wedge		
Recommended Storag	je:	Ambient (20	°C)							1 7	tento		
Nominal Concentration (µg/ml	L):	1000							Ked		una		
NIST Test Number	er:	6UTB		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	102622	2
Volume shown below	v was dilut	ed to (mL):	2000.02	0.058	Flask Uncertai	nty							
									Expanded		SDS Informa	tion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent 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





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

							Trace M	etals	s 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	Р	<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	Мо	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	Т	Au	<0.02	Pb	< 0.02	Nd	<0.02	Κ	<0.2	Sc	<0.02	Та	<0.02	Ti	<0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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Certified by:

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)	\leq 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl2)	\leq 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	\leq 0.05 ppm	< 0.03 ppm
Sulfate (SO4)	\leq 0.5 ppm	< 0.3 ppm
Sulfite (SO3)	\leq 0.8 ppm	0.3 ppm
Ammonium (NH4)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	\leq 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	\leq 10.0 ppb	< 0.2 ppb
Arsenic and Antimony (as As)	\leq 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Bismuth (Bi)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	\leq 20.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	37.0 ppb
Trace Impurities – Chromium (Cr)	\leq 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities - Copper (Cu)	\leq 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities - Germanium (Ge)	\leq 3.0 ppb	< 2.0 ppb
Trace Impurities - Gold (Au)	\leq 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	\leq 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	1 ppb

>>> Continued on page 2 >>>

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





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

Test	Specification	Result
Trace Impurities - Lead (Pb)	\leq 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	\leq 10.0 ppb	1.0 ppb
Trace Impurities – Manganese (Mn)	\leq 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	\leq 0.5 ppb	0.1 ppb
Trace Impurities - Molybdenum (Mo)	\leq 10.0 ppb	< 3.0 ppb
Trace Impurities – Nickel (Ni)	\leq 4.0 ppb	< 0.3 ppb
Trace Impurities – Niobium (Nb)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	\leq 9.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se), For Information Only		1.0 ppb
Trace Impurities – Silicon (Si)	\leq 100.0 ppb	< 0.4 ppb
Trace Impurities – Silver (Ag)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	\leq 100.0 ppb	1.9 ppb
Trace Impurities – Strontium (Sr)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	\leq 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (TI)	\leq 5.0 ppb	< 2.0 ppb
Trace Impurities – Tin (Sn)	\leq 5.0 ppb	< 0.8 ppb
Trace Impurities - Titanium (Ti)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities - Vanadium (V)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	\leq 5.0 ppb	< 0.3 ppb
Trace Impurities – Zirconium (Zr)	\leq 1.0 ppb	< 0.1 ppb

>>> Continued on page 3 >>>

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





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

	Test Specification Result	
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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

James Techie

Jamie Ethier Vice President Global Quality

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





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 (PO4)	\leq 0.10 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	\leq 40.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities – Barium (Ba)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Beryllium (Be)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	\leq 20.0 ppb	< 10.0 ppb
Trace Impurities – Boron (B)	\leq 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	\leq 50 ppb	< 1 ppb
Trace Impurities – Calcium (Ca)	\leq 50.0 ppb	3.1 ppb
Trace Impurities - Chromium (Cr)	\leq 30.0 ppb	2.8 ppb
Trace Impurities - Cobalt (Co)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Gallium (Ga)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	\leq 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	\leq 20 ppb	< 5 ppb
Heavy Metals (as Pb)	\leq 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	\leq 40.0 ppb	4.2 ppb
Trace Impurities - Lead (Pb)	\leq 20.0 ppb	< 10.0 ppb
Trace Impurities – Lithium (Li)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Magnesium (Mg)	\leq 20 ppb	< 1 ppb
Trace Impurities – Manganese (Mn)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Nickel (Ni)	\leq 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>

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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)	\leq 20.0 ppb	< 1.0 ppb
Trace Impurities – Sodium (Na)	\leq 150.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	\leq 30.0 ppb	< 1.0 ppb
Trace Impurities – Tantalum (Ta)	\leq 10.0 ppb	< 5.0 ppb
Trace Impurities - Thallium (TI)	\leq 10.0 ppb	< 5.0 ppb
Trace Impurities – Tin (Sn)	\leq 20.0 ppb	< 10.0 ppb
Trace Impurities – Titanium (Ti)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Vanadium (V)	\leq 10.0 ppb	< 1.0 ppb
Trace Impurities – Zinc (Zn)	\leq 20.0 ppb	< 1.0 ppb
Trace Impurities – Zirconium (Zr)	\leq 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 µm and greater	\leq 60 par/ml	13 par/ml
Particle Count - 1.0 µm and greater	\leq 10 par/ml	3 par/ml

>>> Continued on page 3 $\rightarrow>>$



J.T.Baker

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

Specification Result

For Microelectronic Use

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

James Techie

Jamie Ethier Vice President Global Quality

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m/z->	N.5 6	m/z-≯ 5.0E5	ភ. ០ ពេស	m/z-> 1.0≣6	5000	1.0트4	1. Chromium(III) nitrate nonahydrate (Cr)	Compound	Volume sho	Expiration Date: Recommended Storage: Nominal Concentration (Jug/mL):	Par De	CERTIFIED WEIGHT REPORT:	www.absolutestandards.com
N O		110		1		[1] Spectrum No.1		Pa	Volume shown below was diluted to (mL):	Expiration Date: nended Storage: ntration (µg/mL):	Part Number: Lot Number: Description:	0	3
220		120		N. O		-	58124 071122	Part Lot Number Number	filuted to (mL):	060526 Ambient (20 °C) 1000	<u>58024</u> 060523 Chromium (Cr)		A
230		130		ů. O		31,393 80	0.1000	Dilution Factor	2000.02		1 (Cr)		MS
240		140				c]:57024.	200.0 0.084	Initial Uncertainty Vol. (mL) Pipette (mL)	0.058 Flask U				MS658
				ð.		31,393 sec]:57024.D# [Count] [Línear]	084 1000	Uncertainty Nominal Pipetta (mL) Conc. (µg/mL)	Flask Uncertainty		21110221 2.0%	Lot #) A
N 50		」 () () () () () () () () () ()		S		t] [Linear]	10 10000.1	nał Initial g/mL) Conc. (µg/mL)		(mL)	221 Nitric Acid % 40.0	# Solvent:	
200		160		0		ş	0.1 1000.0	al Final rg/mL) Conc. (µg/mL)		Ľ	Acid .0 Nitric Acid	ent:	123
		170		70			0.0 2.2	Expanded al Uncertainty ig/mL) +/- (µg/mL)	Lineviewed by.	X	Acid Formulated By:		1
		180		8- 0-		1	7789-02-8) CAS		a la	Horner		
		190		Ŷ				jolvent Os		ten	Lawrence Barry		Y
		20- 00-		100			0.5 mg(Cr)/m3 ort-	SDS Information nt Safety Info. On Attac OSHA PEL (TWA)		Ø	nce Barry		AH-15: https://Ab
		0		o			ort-rat 3250 mg/kg	ched pg.) LDS0	00000	00050	060523		AH-1539 Certificate Number https://Absolutestandards.com
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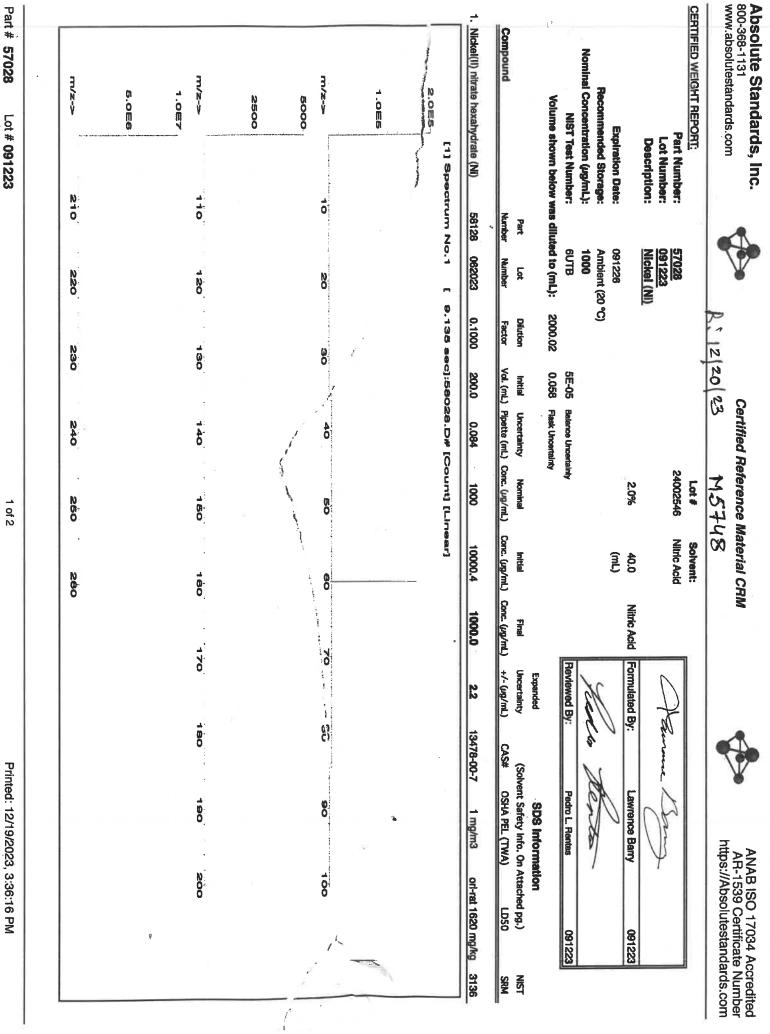
Part # 58024 Lot # 060523

1 of 2

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Absolute Standards, Inc. Certified Reference 800-368-1131 Image: Certified Reference www.absolutestandards.com Image: Certified Reference Instrumental Analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS):	andards.cor	s by Indu	ictive	y Coupled	Plasn	na Mass S	Spectr C	Certified Reference Material Ci	ICP-M	IS):	ateria	I CRM					¥	크	ANAB AR-11 ttps:///	ANAB ISO 17034 Accredited AR-1539 Certificate Number https://Absolutestandards.com	034 Acc lificate N standar	lumbe ds.corr
the stype of the style						Trace N	Metals	s Verification	ation	হ	ICP-MS		/g/mL)									
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	_	<0.02	말	<0.02	5	<0.02	Mg	<0.01	² 0	<0.02	.02	Rh	40.02	Ag	<0.02	1	<0.02			<0.02		
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								(T)=	(T)= Target analyte	anatyte												
Physical Characterization:	aracteriz	ation:															C	Certified by:	by:		a	
Homogeneity: No heterogeneity was observed in the preparation of this standard.	No heteroge	meity was o	observe	d in the preps	aration (of this stand	lard.										1	14	1		ľ	
 * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	ad value is ds, 18.2 n ation of all are prepar are prepar are certife ds should ds should ent Result.	he conc megohm d Ill standarc are me ars are me are are are me ars are me ars are me ars are me ars are me ars are me are are are me are are are me are	entrat leioniz ls. sticulou etrica .5% of .5% of .5	ed water, c ed water, c usly cleane ully using ba f the state f the state f the state and Kuyat, a Note 122	ted fro calibrat d prior alanced d value and un and un 97, U.S	red Class, ted Class, that are that are that are der appro Guideline Guideline	A glass A glass calibra priate s for E nent P	nd volume sware and ited with ites stated laborator, ivaluating vinting Off	the hi weight cond y cond fice, W	ighest p ighest p is trace itions. xpressir /ashingt	ments ourity able tr able the ton, D.	unless raw m raw m NIST 0 NIST 0. C. (19	materials are used in Materials are used in ST (see above). ertainty of NIST 1994).	se stat re usec vve). NIST	n .							

Part # 58024 Lot # 060523



1 of 2

Part # 57028 Lot # 091223 2 of 2		 * Purified acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in the preparation of all standards. * All standard containers are meticulously cleaned prior to use. * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above). * Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated. * All Standards should be stored with caps tight and under appropriate laboratory conditions. * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994). 	Homogeneity: No heterogeneity was observed in the preparation of this standard.	(T) = Target aria/vie	AI A02 Cd A02 Dy A02 H A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N T Pr A02 S A02 C4 A02 E A02 H A02 Li A02 N A02 N <t< th=""><th>Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL)</th><th>www.absolutestandards.com</th></t<>	Instrumental Analysis by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS): Trace Metals Verification by ICP-MS (µg/mL)	www.absolutestandards.com
			et .	2	Tb 40.02 Te 40.02 TI 40.02 Th 40.02 Sn 40.02 Ti 40.02		
	5 		P. S.	Certified by:	W -0.02 U -0.02 V -0.02 Yb -0.02 Yb -0.02 Yb -0.02 Zn -0.02 Zr -0.02 Zr -0.02		AR-1539 Certificate Number https://Absolutestandards.com

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

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		Inc



Certified Reference Material CRM



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

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

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

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 58112 Lot # 091823



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, Cerium, Thallium,	Aluminum, Selenium,
	100 μg/mL ea: Lead,	Calcium,
	80 μg/mL ea: Arsenic,	
	70 μg/mL ea: Mercury,	
	50 μg/mL ea: Nickel,	
	40 μg/mL ea: Chromium,	
	30 μg/mL ea: Copper, Vanadium,	Boron,
	20 μg/mL ea: Zinc, Barium, Cadmium, Manganese,	Strontium, Beryllium, Cobalt, Lithium,
	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 ± 4 $^{\circ}$ C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
AI	ICP Assay	3101a	140903
AI	EDTA	928	928
As	ICP Assay	3103a	100818
В	ICP Assay	3107	190605
Ва	ICP Assay	3104a	140909
Ва	Gravimetric		See Sec. 4.2
Ве	ICP Assay	3105a	090514
Са	ICP Assay	3109a	130213
Са	EDTA	928	928
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Ce	ICP Assay	3110	090504
Ce	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
К	ICP Assay	3141a	140813
К	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	Traceable to 3152A	S2-NA700842
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
P	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	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA Bogo (928	928

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

Characterization of CRM/RM by Two or More Methods	Characterization of CRM/RM by One Method
Certified Value, X _{CRMRM} , where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results:
X _{CRM/RM} = ∑(w _i) (X _i) X _i = mean of Assay Method i with standard uncertainty u _{char i} w _i = the weighting factors for each method calculated using the inverse square of the variance: w _i = (1/u _{char}) ² / (Σ(1/(u _{char}) ²)	XCRM/RM = (X _a) (u _{char a}) X _a = mean of Assay Method A with u _{char a} = the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k (u ² _{char} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^{y_2} k = coverage factor = 2 u _{char} = [Σ ((w _i) ² (u _{char} i) ²) ^{y_2} where u _{char} i are the errors from each characterization method u _{bb} = bottle to bottle homogeneity standard uncertainty u _{lts} = long term stability standard uncertainty (storage) u _{ts} = transport stability standard uncertainty	$\begin{aligned} & CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k \left(u^2_{\ char \ a} + u^2_{\ bb} + u^2_{\ lts} + u^2_{\ tr} \right) \\ & k = coverage factor = 2 \\ & u_{char \ a} = the errors from characterization \\ & u_{bb} = bottle \ standard \ uncertainty \\ & u_{lts} = long term stability standard \ uncertainty \\ & u_{ts} = transport stability standard \ uncertainty \end{aligned}$

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.

ts)^{1/2}

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 30, 2022

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

11.2 Lot Expiration Date

- August 30, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

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Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

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Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

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
CERTIFIED VALUES	AND UNCERTAINTIES

ANALYTE Antimony, Sb	CERTIFIED VALUE 80.1 ± 0.6 µg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 40.04 ± 0.24 µg/mL
Silica, SiO2	200.2 ± 1.1 μg/mL	Tin, Sn	70.1 ± 0.4 μg/mL

Titanium, Ti 20.02 ± 0.14 μg/mL

1.025 g/mL (measured at 20 ± 4 °C)

Assay Information:

Density:

3.0

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

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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 Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines