

284 Sheffield Street, Mountainside, New Jersey 07092, Phone: 908 789

8900, Fax: 908 789 8922

Prep Standard - Chemical Standard Summary

Order ID: P2687

Test: TCLP Mercury, TCLPMetals Group1

Prepbatch ID: PB161289,PB161315,

Sequence ID/Qc Batch ID: LB131042,LB131042,LB131063,

Standard ID:

MP79051, MP80763, MP80764, MP80765, MP80766, MP80767, MP80768, MP80769, MP80770, MP80771, MP80772, MP80773, MP80776, MP80777, MP80796, MP80797, MP80798, MP80799, MP80880, MP80881, MP80882, MP80883, MP80884, MP80885, MP80886, MP80887, MP80888, MP80889, MP80890, MP80891, MP80892, MP80894, MP80894, MP80890, MP80890, MP80891, MP80890, MP80800, MP80800, MP80800, MP80800, MP808000, MP808000, MP808000, MP808000, MP808000, MP808000, MP80

Chemical ID:

M4371,M4465,M4877,M4883,M4885,M4888,M4889,M4916,M4960,M4961,M5062,M5130,M5192,M5200,M5218,M5223,M5224,M5227,M5228,M5288,M5294,M5296,M5298,M5387,M5393,M5466,M5467,M5496,M5498,M5531,M5643,M5649,M5658,M5673,M5697,M5698,M5747,M5748,M5762,M5768,M5776,M5798,M5799,M5800,M5801,M5814,M5816,M5818,M5819,M5820,M5875,M5884,M5894,M5896,M5905,M5910,M5915,W2606,



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Metals STANDARD PREPARATION LOG

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
170	1:1HCL	MP79051	01/19/2024	02/20/2025	Al-Terek Isaac	_		
						LE_2 (M SC-2)	ETTE_1 (ICP	01/19/2024

FROM 1250.0000ml of M5762 + 1250.0000ml of W2606 = Final Quantity: 2500.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
902	ICP AES CAL BLK (SO/ICB/CCB)	MP80763	05/20/2024	07/30/2024	Sarabjit Jaswal	None	None	
								05/23/2024

FROM 125.00000ml of M5894 + 2350.00000ml of W2606 + 25.00000ml of M5905 = Final Quantity: 2500.000 ml



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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By
907			05/20/2024		Sarabjit Jaswal		METALS_PIP ETTE_3 (A)	Mohan Bera 05/23/2024
FROM	5.00000ml of M5224 + 5.00000ml of	M5228 + 5.	00000ml of M	5296 + 5.0000	Oml of M5393 +	5.00000ml of M		0ml

of M5816 + 5.00000ml of M5820 + 5.00000ml of M5875 + 460.00000ml of MP80763 = Final Quantity: 500.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
910	ICP AES STD S4	MP80765	05/20/2024	07/30/2024	Sarabjit Jaswal	None	None	
								05/23/2024

FROM 50.00000ml of MP80763 + 50.00000ml of MP80764 = Final Quantity: 100.000 ml



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Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Mohan Bera
909	ICP AES STD S3	MP80766	05/20/2024	07/30/2024	Sarabjit Jaswal	None	METALS_PIP ETTE_3 (A)	

FROM 25.00000ml of MP80764 + 75.00000ml of MP80763 = Final Quantity: 100.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME.	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3913	ICP AES STD S2	MP80767	05/20/2024	07/30/2024	Sarabjit Jaswal	None	None	
								05/23/2024

FROM 16.00000ml of MP80764 + 89.75000ml of MP80763 = Final Quantity: 100.000 ml



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Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
2950	ICP AES S1/CRI STOCK STD	MP80768	05/20/2024	07/30/2024	Sarabjit Jaswal	None	None	
								05/23/2024

FROM

0.03000 ml of M4877 + 0.03000 ml of M5798 + 0.05000 ml of M4885 + 0.05000 ml of M5496 + 0.05000 ml of M5658 + 0.10000 ml of M4883 + 0.10000 ml of M5228 + 0.10000 ml of M5747 + 0.10000 ml of M5801 + 0.10000 ml of M5820 + 0.15000 ml of M5800 + 0.20000 ml of M4888 + 0.20000 ml of M4889 + 0.20000 ml of M5227 + 0.20000 ml of M5799 + 0.25000 ml of M5224 + 0.25000 ml of M5466 + 0.50000 ml of M5814 + 1.00000 ml of M5192 + 1.75000 ml of M5819 + 10.00000 ml of M5200 + 12.50000 ml of M5697 + 2.00000 ml of M5816 + 2.00000 ml of M5818 + 2.25000 ml of M5698 + 2.50000 ml of M5748 + 5.00000 ml of M5288 + 9.00000 ml of M5498 + 9.00000 ml of M5768 + 25.25000 ml of M780763 = Final Quantity: 10000.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
2951	ICP AES S1/CRI WORK STD	MP80769	05/20/2024	07/30/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	05/23/2024

FROM 2.00000ml of MP80768 + 98.00000ml of MP80763 = Final Quantity: 100.000 ml





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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Mohan Bera
912	ICP AES ICV SOLN	MP80770	05/20/2024	07/30/2024	Sarabjit Jaswal	None	None	
	<u> </u>							05/23/2024

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
904	ICP AES ICSA SOLN	MP80771	05/20/2024	07/30/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	05/23/2024

FROM 10.00000ml of M5130 + 90.00000ml of MP80763 = Final Quantity: 100.000 ml



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Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
3494	ICP AES ICSAB SOLN-1	MP80772	05/20/2024	07/30/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	05/23/2024

FROM (0.10000ml of M5296 -	+ 10.00000ml of M5130 +	+ 10.00000ml of M5223	+ 79.90000ml of MP80763	= Final Quantity: 100.000 ml
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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
911			05/20/2024	<u></u>	Sarabjit Jaswal		METALS_PIP ETTE 3 (A)	Mohan Bera 05/23/2024

FROM 125.00000ml of MP80763 + 125.00000ml of MP80764 = Final Quantity: 250.000 ml



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Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
919	ICP AES INTERNAL STD	MP80776	05/20/2024	07/30/2024	Sarabjit Jaswal	None	METALS_PIP	
							ETTE_3 (A)	05/23/2024

FROM	1.00000ml of M4961 +	10.00000ml of M4960 +	1969.00000ml of W2606 +	+ 20.00000ml of M5905	= Final Quantity: 2000.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Mohan Bera
513	RINSE SOLN	MP80777	05/20/2024	07/30/2024	Sarabjit Jaswal	None	None	
								05/23/2024

FROM 200.00000ml of M5905 + 9800.00000ml of W2606 = Final Quantity: 10000.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	NAME	<u>NO.</u>	Prep Date	<u> </u>	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
3965	2:1 H2SO4 : HNO3	<u>MP80796</u>	05/24/2024	11/16/2024	Mohan Bera	None	None	05/24/2024

Recipe ID	NAME.	NO.	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
65	POTASSIUM PERMANGANATE SOLUTION 5 %	MP80797	05/24/2024	10/24/2024		METALS_SCA LE_3 (M SC-3)		05/24/2024

FROM 100.00000gram of M4916 + 2000.00000ml of W2606 = Final Quantity: 2000.000 ml



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Recipe ID	NAME.	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
66	POTASSIUM PERSULFATE SOLUTION 5 %	MP80798	05/24/2024	10/24/2024		METALS_SCA LE_3 (M SC-3)		05/24/2024

FROM 100.00000ml of M4465 + 2000.00000ml of W2606 = Final Quantity: 2000.000 ml

Recipe ID	NAME.	NO.	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
67		MP80799	05/24/2024	10/24/2024		METALS_SCA		
	HYDROXYL- CHLORIDE					LE_3 (M SC-3)		05/24/2024

FROM 2000.0000ml of W2606 + 240.00000gram of M4371 + 240.00000gram of M5884 = Final Quantity: 2000.000 ml



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Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP80880	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG	
							A)	

FROM 1.00000ml of M5915 + 2.50000ml of M5062 + 96.50000ml of W2606 = Final Quantity: 100.000 ml

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1340	Hg 0.00 PPB STD	MP80881	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG	•

FROM 2.50000ml of M5915 + 247.50000ml of W2606 = Final Quantity: 250.000 ml



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal	
1341	Hg 0.2 PPB STD	MP80882	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG		
	A)								

FROM 2.50000ml of M5915 + 247.30000ml of W2606 + 0.20000ml of MP80880 = Final Quantity: 250.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1342	Hg 2.5 PPB STD	MP80883	06/04/2024	06/05/2024	Mohan Bera	None	METALS_PIP ETTE_5 (HG	,

FROM 2.50000ml of M5915 + 245.00000ml of W2606 + 2.50000ml of MP80880 = Final Quantity: 250.000 ml



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal	
1343	Hg 5.0 PPB STD	MP80884	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG		
	A)								

FROM 2.50000ml of M5915 + 242.50000ml of W2606 + 5.00000ml of MP80880 = Final Quantity: 250.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1344	Hg 7.5 PPB STD	MP80885	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG	•

FROM 2.50000ml of M5915 + 240.00000ml of W2606 + 7.50000ml of MP80880 = Final Quantity: 250.000 ml



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Metals STANDARD PREPARATION LOG

Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal	
1345	Hg 10.0 PPB STD	MP80886	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG		
	A)								

FROM 2.50000ml of M5915 + 237.50000ml of W2606 + 10.00000ml of MP80880 = Final Quantity: 250.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1346	Hg ICV SOLUTION	MP80887	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	06/04/2024

FROM 2.50000ml of M5531 + 2.50000ml of M5915 + 245.00000ml of W2606 = Final Quantity: 250.000 ml



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Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal	
1351	ICB (Hg 0.00 PPB SOLUTION)	MP80888	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG		
	A)								

FROM 2.50000ml of M5915 + 247.50000ml of W2606 = Final Quantity: 250.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1358	CCV (Hg 5.0 PPB SOLUTION)	MP80889	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP	
							ETTE_5 (HG	06/04/2024

FROM 485.00000ml of W2606 + 5.00000ml of M5915 + 10.00000ml of MP80880 = Final Quantity: 500.000 ml



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Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal	
1352	CCB (Hg 0.00 PPB SOLUTION)	MP80890	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG		
	A)								

FROM 495.00000ml of W2606 + 5.00000ml of M5915 = Final Quantity: 500.000 ml

Recipe ID	NAME.	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
1349	CRA/CRI (Hg 0.2 PPB SOLUTION)	MP80891	06/04/2024	06/05/2024	Mohan Bera	None	METALS_PIP ETTE_5 (HG	

FROM 2.50000ml of M5915 + 247.30000ml of W2606 + 0.20000ml of MP80880 = Final Quantity: 250.000 ml



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Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal	
1350	CHK STD (Hg 7.0 PPB SOLUTION)	MP80892	06/04/2024	06/05/2024	Mohan Bera		METALS_PIP ETTE_5 (HG		
	A)								

FROM 2.50000ml of M5915 + 240.50000ml of W2606 + 7.00000ml of MP80880 = Final Quantity: 250.000 ml

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
68	STANNOUS CHLORIDE SOLUTION	MP80894	06/04/2024	06/05/2024		METALS_SCA LE_3 (M SC-3)		06/04/2024

FROM 450.00000ml of W2606 + 50.00000gram of M5776 + 50.00000ml of M5896 = Final Quantity: 500.000 ml



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	07/01/2019 / RICHARD	06/07/2019 / RICHARD	M4371
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3238-05 / Potassium Persulfate (2.5kg)	0000234156	08/06/2025	07/23/2019 /	07/25/2019 / manojkumar	M4465
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	08/28/2024	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.	57034 / Se, 1000 PPM, 125 ml	070221	09/07/2025	08/06/2021 / jaswal	08/05/2021 / jaswal	M4883
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
	57047 / Ag, 1000 PPM,	072921	08/29/2024	08/06/2021 /	08/05/2021 /	
Absolute Standards, Inc.	125 ml	072921		jaswal	jaswal	M4885
	-	Lot #	Expiration Date			M4885 Chemtech Lot #



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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	08/30/2024	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 #
Seidler Chemical	BA-3227-05 / Potassium Permanganate (2.5kg)	210800	03/31/2026	11/30/2022 / mohan	07/28/2021 / mohan	M4916
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	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 /	Chemtech Lot #
Absolute Standards, Inc.	58139 / Y, 10000 PPM, 500 ml	052521	06/25/2024	10/09/2021 / jaswal	01/25/2019 / jaswal	M4961
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Inorganic Ventures	MSHG-10PPM / MERCURY HCI 125mL 10ug/mL	S2-HG709270	09/22/2026	05/28/2022 / mohan	01/27/2022 / mohan	M5062
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	01/31/2025	05/20/2024 /	04/20/2021 / bin	M5130



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	09/21/2025	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	11/02/2026	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	01/31/2025	05/20/2024 /	04/20/2021 / bin	M5223
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
			Expiration	Date Opened /	Received Date /	Chemtech
Supplier	ItemCode / ItemName	Lot #	Date	Opened By	Received By	Lot #



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 #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	01/01/2025	12/13/2023 / bin	04/20/2021 / bin	M5294
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	S2-MEB711673	11/02/2026	09/19/2022 / jaswal	08/20/2022 / jaswal	M5296
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
		000400	02/04/2025	05/02/2023 /	06/15/2022 /	
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	020422	02/04/2023	jaswal	jaswal	M5298
		020422 Lot #	Expiration Date			M5298 Chemtech Lot #



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	10/12/2022 / bin	09/19/2022 / bin	M5393
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57058 / Cerium, 1000PPM, 100ML	061322	06/13/2025	03/06/2023 / bin	03/01/2023 / bin	M5466
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 / Al, 10000 PPM, 500 ml	011623	01/16/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5496
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier Absolute Standards, Inc.	ItemCode / ItemName 58120 / Ca, 10000 PPM, 500 ml	Lot # 031523	-	-		
Absolute	58120 / Ca, 10000 PPM,		Date	Opened By 08/15/2023 /	Received By 03/17/2023 /	Lot #



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-9673-33 / Sulfuric Acid, Instra-Analyzed (cs/6c2.5L)	23D2462010	03/20/2028	09/21/2023 / mohan	09/05/2023 / mohan	M5673
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	102523	10/25/2026	04/03/2024 / jaswal	10/27/2023 / jaswal	M5697
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	102623	10/26/2026	04/18/2024 / jaswal	10/27/2023 / jaswal	M5698



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Lead (Pb) 1000PPM	100923	10/09/2026	05/20/2024 / Jaswal	12/20/2023 / jaswal	M5747
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 /	Chemtech Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	0000281938	07/06/2026	06/26/2023 / mohan	07/18/2023 / mohan	M5776
	T		Expiration	Date Opened /	Received Date /	Chemtech
Supplier	ItemCode / ItemName	Lot #	Date	Opened By	Received By	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	071123	07/11/2026	02/09/2024 / bin	02/09/2024 / bin	M5799
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	091923	09/19/2026	05/31/2024 / bin	02/09/2024 / bin	M5800
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57033 / As, 1000 PPM, 125 ml	111323	11/13/2026	02/09/2024 / bin	02/09/2024 / bin	M5801
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	071123	07/11/2026	03/26/2024 / Sohil	01/03/2024 / jaswal	M5814
			Expiration	Date Opened /	Received Date /	Chemtech
Supplier	ItemCode / ItemName	Lot #	Date	Opened By	Received By	Lot #
Supplier Absolute Standards, Inc.	1temCode / ItemName 57016 / S, 1000 PPM, 125 ml	122923	-	Opened By 05/20/2024 / Jaswal	Received By 02/09/2024 / jaswal	Lot # M5816
Absolute	57016 / S, 1000 PPM, 125		Date	05/20/2024 /	02/09/2024 /	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	111623	11/16/2026	03/20/2024 / jaswal	02/09/2024 / jaswal	M5819
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57015 / P, 1000 PPM, 125 ml	091123	09/11/2026	05/01/2024 / jaswal	02/09/2024 / jaswal	M5820
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL	T2-MEB714417	01/27/2027	04/19/2024 / jaswal	02/22/2024 / jaswal	M5875
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000281938	07/06/2026	04/30/2024 / mohan	04/25/2024 / mohan	M5884
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric	240415	11/06/2024	05/17/2024 /	05/07/2024 /	M5894
Seluiei Chemical	Acid, Instra-Analyzed (cs/6x2.5L)			Al-Terek	Al-Terek	W5694
Supplier	Acid, Instra-Analyzed	Lot #	Expiration Date	Al-Terek Date Opened / Opened By	Al-Terek Received Date / Received By	Chemtech



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	11/16/2024	05/20/2024 / Al-Terek	05/07/2024 / Al-Terek	M5905

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	11/29/2024	06/03/2024 / Al-Terek	05/24/2024 / Al-Terek	M5910

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	11/29/2024	05/30/2024 / Al-Terek	05/24/2024 / Al-Terek	M5915

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



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CHEM-CLP-4
Lot Number: S2-MEB711673
Matrix: 3% (v/v) HNO3

3% (v/v) HF

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Boron, B $1\ 000\pm 6\ \mu g/mL$ Molybdenum, Mo $1\ 000\pm 6\ \mu g/mL$ Silicon, Si $1\ 000\pm 7\ \mu g/mL$ Tin, Sn $1\ 000\pm 6\ \mu g/mL$

Titanium, Ti $1000 \pm 7 \mu g/mL$

Density: 1.030 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

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

11.2 Lot Expiration Date

- November 02, 2026

- Sealed TCT Rag Open Date:

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

11.3 Period of Validity

		=	
This CDM/DM should not be us	and langer than one year (or civ	months in the case	of a 20 m

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

Michael 2 Booth

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

Paul R Saines



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CLPP-CAL-1

Lot Number: T2-MEB714417

Matrix: 5% (v/v) HNO3

Value / Analyte(s): 5 000 µg/mL ea:

Calcium, Potassium, Magnesium, Sodium,

2 000 μg/mL ea:

Aluminum, Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese, 250 μg/mL ea:

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 ± 0.26 μg/mL	Calcium, Ca	5 000 ± 22 μg/mL
Chromium, Cr	200.0 ± 1.0 μg/mL	Cobalt, Co	500.0 ± 2.4 μg/mL
Copper, Cu	250.0 ± 1.0 μg/mL	Iron, Fe	1 000 ± 4 μg/mL
Magnesium, Mg	5 000 ± 20 μg/mL	Manganese, Mn	500.0 ± 2.0 μg/mL
Nickel, Ni	500.0 ± 2.2 μg/mL	Potassium, K	5 000 ± 19 μg/mL
Silver, Ag	250.0 ± 1.1 μg/mL	Sodium, Na	5 000 ± 18 μg/mL
Vanadium, V	499.7 ± 2.2 μg/mL	Zinc, Zn	500.0 ± 2.2 μg/mL

Density: 1.118 g/mL (measured at 20 ± 4 °C)

Assay Information:

13.	ay iiii Oi iii atioii.			
	ANALYTE	METHOD	NIST SRM#	SRM LOT#
	Ag	ICP Assay	3151	160729
	Ag	Volhard	999c	999c
	Al	ICP Assay	3101a	140903
	Al	EDTA	928	928
	Ва	ICP Assay	3104a	140909
	Ва	Gravimetric		See Sec. 4.2
	Ве	ICP Assay	3105a	090514
	Ве	Calculated		See Sec. 4.2
	Ca	ICP Assay	3109a	130213
	Ca	EDTA	928	928
	Co	ICP Assay	3113	190630
	Co	EDTA	928	928
	Cr	ICP Assay	3112a	170630
	Cr	Calculated		See Sec. 4.2
	Cu	ICP Assay	3114	121207
	Cu	EDTA	928	928
	Fe	ICP Assay	3126a	140812
	Fe	EDTA	928	928
	K	ICP Assay	3141a	140813
	K	Gravimetric		See Sec. 4.2
	Mg	ICP Assay	3131a	140110
	Mg	EDTA	928	928
	Mn	ICP Assay	3132	050429
	Mn	EDTA	928	928
	Na	ICP Assay	3152a	120715
	Na	Gravimetric		See Sec. 4.2
	Ni	ICP Assay	3136	120619
	Ni	EDTA	928	928
	V	IC Assay	3165	160906
	V	EDTA	928	928
	Zn	ICP Assay	3168a	120629
	Zn	EDTA	928	928

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 27, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

Sealed TCT Bag Open Date:	
· Sealeo TCT Bao Oberi Dale	

- 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

DD9784.



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

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

> Arsenic, Lead, Selenium, Thallium,

500 µg/mL ea: Cadmium

1 000 µg/mL ea:

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

Thallium, TI 1 000 ± 7 µg/mL

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

Assay Information:

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

Sealed TCT Bag Open Date:	
· Sealeo TCT Bao Oberi Dale	

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

20178Ci

Sodium Chloride, Crystal BAKER ANALYZED® A.C.S. Reagent





Material No.: 3624-01

Batch No.: 0000281938

Manufactured Date: 2021-06-07

Retest Date: 2026-06-07

Revision No.: 1

M SAZO RSZ

Certificate of Analysis

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

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



M4371

Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent

Suitable for Mercury Determination (hydroxylammonium chloride)

Rec - 06.07.12





Material No.: 2196-01

Batch No.: 0000215387

Manufactured Date: 2018/06/27 Retest Date: 2025/06/25

Revision No: 1

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Specification	Result	
>= 96.0 %	99.1	
Passes Test	PT	
<= 0.050 %	0.017	
<= 0.25	0.19	
Passes Test	PT	
<= 0.005 %	< 0.003	
<= 5 ppm	4	
<= 5 ppm	< 3	
<= 0.050 ppm	< 0.005	
	>= 96.0 % Passes Test <= 0.050 % <= 0.25 Passes Test <= 0.005 % <= 5 ppm <= 5 ppm	

For Laboratory, Research or Manufacturing Use

Country of Origin:

CN

Packaging Site:

Paris Mfg Ctr & DC



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

Jamie Ethier
Vice President Global Quality

Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

20370011

2.0%



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

> Part Number: 57048 072821 Lot Number:

Description: Cadmium (Cd)

Part

Expiration Date: 072824

Recommended Storage: Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

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

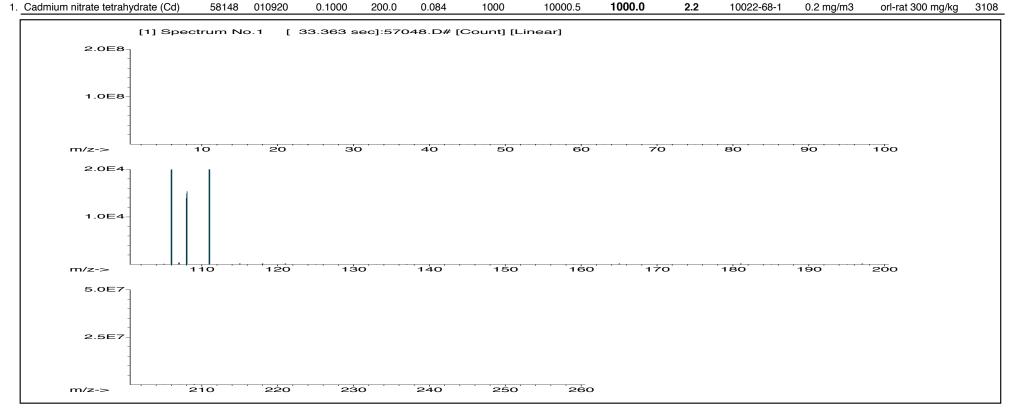
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

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

SDS Information

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

Nominal



Certified Reference Material CRM



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

Bu P. All

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57034

 Lot Number:
 070221

Description: Selenium (Se)

Expiration Date: 070224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

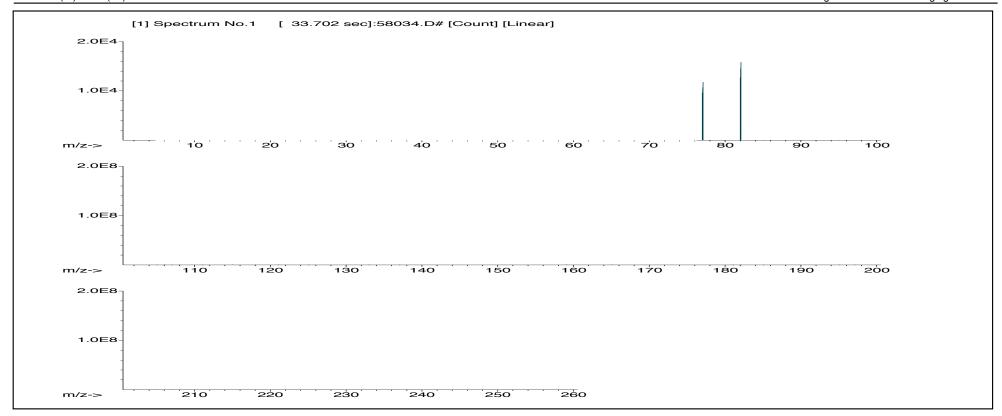
Formulated By: Giovanni Esposito 070221

Lector Denta 070221

Reviewed By: Pedro L. Rentas 070221

SDS Information

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



Certified Reference Material CRM



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

Sn P. Shi

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

> Part Number: 57047 Lot Number: 072921

Description: Silver (Ag)

Expiration Date: 072924

Recommended Storage: Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

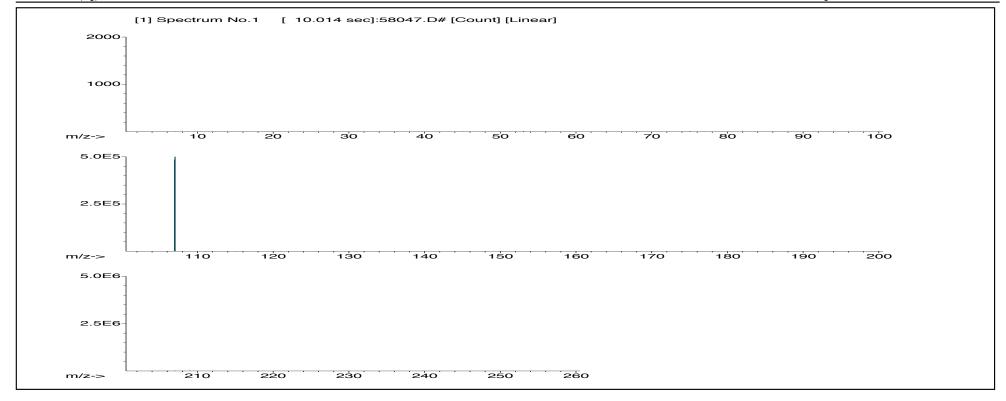
> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

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

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

SDS Information

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



Certified Reference Material CRM



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

Bu P. Sha

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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Certified Reference Material CRM

20370011

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57022

 Lot Number:
 070721

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

Expiration Date: 070724

Part

Recommended Storage: Ambient (20 °C)

Nominal Concentration (μ g/mL): 1000

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

Dilution

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

Lot

Formulated By: Lawrence Barry 070721

Lawrence Barry 070721

Reviewed By: Pedro L. Rentas 070721

SDS Information

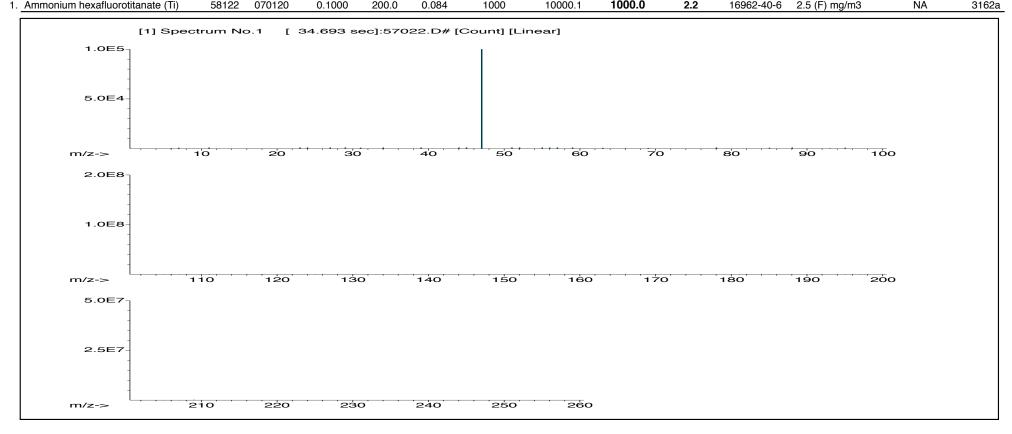
(Solvent Safety Info. On Attached pg.)

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

Nominal

Uncertainty

Initial



Certified Reference Material CRM



Certified by:

Bu f. All

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

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

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

(T)= Target analyte

Physical Characterization:

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

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

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

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

Absolute Standards, Inc.

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Certified Reference Material CRM

20370011

Nitric Acid

40.0

(mL)

Nitric Acid



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57081

 Lot Number:
 073021

Description: Thallium (TI)

2.0% **Expiration Date:** 073024

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

Formulated By: Giovanni Esposito 073021

Reviewed By: Pedro L. Rentas 073021

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

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

Certified Reference Material CRM



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

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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



M4913- 16



Certificate of Analysis

1 Reagent Lane Fair Lawn, NJ 07410 201.796.7100 tel 201.796.1329 fax

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2015 by SAI Global Certificate Number CERT – 0120632

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

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

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

Julian Burton

Julian Burton - Quality Control Manager - Fair Lawn

800-368-1131 Absolute Standards, Inc.

www.absolutestandards.com



Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: Description:

58149

100721

Indium (In)

R: 10/08/

Lot #

Solvent: 20370011 Nitric Acid

Giovannie

reporter

5%

Nitric Acid

(III) 25.0

> Formulated By: Giovanni Esposito

> > 100721

Reviewed By:

Indium Oxide (In)

IN086 W1096A

10000

99.999

0.10

82.6

6.05408

6.05441

10000.6

20.1

1312-43-2

Z

3124a

RM#

Number Lot

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/mL)

+/- (µg/mL)

CAS#

(Solvent Safety Info. On Attached pg.)

OSHA PEL (TWA) LD50

NIST SRM

Target

Actual

Actual

Uncertainty Expanded

Nominal

Purity Uncertainty Assay

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

10000

Ambient (20 °C)

Recommended Storage:

Expiration Date:

100724

Weight shown below was diluted to (mL):

500.06

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

Pedro L. Rentas

100721

SDS Information

m/z->	2.5E6	m/z->	1.0E6	m/z-> 2.0E6	2.5E7	5.0E7
210		110		10		[1] Spectrum No.1
220		120		N O		
230		130		30		965 sec]:57
240		140		40		[12.965 sec]:57049.D# [Count] [Linear]
250		150		50		ount] [Linea
260		160		60		٥
		170		70		
		180		80		
		190		9		
		200		100		



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

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

	-		-				
₩	Bi	Ba	As	Sb	A		
40.02	♦ 0.01	40.02	0.2	<0.02	<0.02		
Cr.	ರಿ ರ	S	င့	Ca	ß		
<0.02	<0.02	<0.02	<0.02	40.2	<0.02		
<u>≱</u>	ද ව	8	Eu	甲	Dy		
<0.02	<0.02 0.02	<0.02	<0.02	<0.02	<0.02		
P	L F	F	In	Но	Hf		
<0.02	40,02	<0.02	7	<0.02	<0.02	I acc ivid	Trace Ma
Z S	M _o	M	Mg	Lu	<u>L</u> .	icrais	2+2/2
40.02 K	402	<0.02	40.01	<0.02	<0.02	ACHICA	Vorificat
R :	Ā Þ	Pd	õ	S	Z		2
	<0.02 €0.02	<0.02	<0.02	<0.02	<0.02	y ICF-IVIO	WICD MC
Sc S	S P	R _b	Rh.	Re	꾸	649	
40.02	A 0.02	<0.02	<0.02	<0.02	<0.02		1
ia o	Sr.	N _a	Ag	Si	Se		
40.02	A 0.02	0.2	<0.02	40.02	40.2		
=1 }	S T	ħ	Ħ	Te	Тb		
40.02	A A.02	<0.02	<0.02	<0.02	40.02		
7.7	7 4	4,4	<	c	W		
<0.02	A 0.02	<0.02	<0.02	<0.02	<0.02		

(I)= larger analyte

Physical Characterization:

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

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

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

Absolute Standards, Inc. 800-368-1131

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Certified Reference Material CRM 180/08



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

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

2%

Nitric Acid

Formulated By:

Lawrence Barry

052521

40.0

Reviewed By:

Pedro L. Rentas

052521

Description: 052521 Yttrium (Y)

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

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

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

Yttrium (III) Oxide (Y)

IN087 YV012015B1

10000

99.999

0.10

77.9

25.6744

25.6745 10000.0

20.0

1314-36-9

¥

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

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

Part # 58139

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

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

Physical Characterization:

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

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

* 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 # 58139



Certificate of Analysis

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

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Mass Spec Solution

Catalog Number:

MSHG-10PPM

Lot Number:

S2-HG709270

Matrix:

10% (v/v) HCI

Value / Analyte(s):

10 μg/mL ea:

Mercury

Starting Material:

Hg metal

Starting Material Lot#:

1959

Starting Material Purity:

99.9994%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

 $10.001 \pm 0.053 \,\mu g/mL$

Density:

1.020 g/mL (measured at 20 ± 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

the variance.

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

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

k = coverage factor = 2

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

u_{bb} = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

Xa = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²char a + u²bb + u²lts + u²ts) 1/2

k = coverage factor = 2

u_{char a} = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 22, 2021

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

11.2 Lot Expiration Date

- September 22, 2026
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

Sealed TCT	Bag	Open Date	:		

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Mya Truong

Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Laines





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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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







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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

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

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

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

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

ICSA M5126 M5127 M5128 M5129 M5130

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

value \pm 15 percent of the listed certified value.

ICSB

M5219

M5220

M5221

M5222

M5223

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

M.5192 R: 06/17/2

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

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

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

Certified Reference Material CRM



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

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

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Physical Characterization:

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

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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



Certified Reference Material CRM

0



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number:

Lot #

Solvent: 20370011 Nitric Acid

2%

60.0 (IE)

Nitric Acid

Formulated By:

Giovanni Esposito

092121

Pedro L. Rentas

092121

SDS Information

Giranie

rapider

Description: Sodium (Na)

092121 58111

Recommended Storage: **Expiration Date:** 092124

Ambient (20 °C)

Nominal Concentration (µg/mL): 10000

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

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

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Part # 58111



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

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

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Pb	5	Fe	F	In	Н	Hf			
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Physical Characterization:

(I)= Target analyte

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

Certified by:

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

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

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

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

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

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

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

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



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CHEM-QC-4

Lot Number: S2-MEB711674

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

3 /0 (V/V) I II

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

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

Assay Information:

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

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

11.2 Lot Expiration Date

- November 02, 2026

- Sealed TCT Rag Open Date:

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

11.3 Period of Validity

		=	
This CDM/DM should not be us	and langer than one year (or civ	months in the case	of a 20 m

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

Michael 2 Booth

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

Paul R Saines





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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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







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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

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

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

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

Al 200 255000 216000 294000 247000 2090	
	711
Sb 60 (0.0) -60.0 60.0 618 529) /
As 10 (0.0) -10.0 10.0 104 88.	4 120
Ba 200 (6.0) -194 206 (537) 33	7 737
Be 5.0 (0.0) -5.0 5.0 495 420	570
Cd 5.0 (1.0) -4.0 6.0 972 820	3 1120
Ca 5000 245000 208000 282000 235000 1990	00 271000
Cr 10 (52.0) 42.0 62.0 542 460	624
Co 50 (0.0) -50.0 50.0 476 404	1 548
Cu 25 (2.0) -23.0 27.0 511 43	588
Fe 100 101000 85600 116500 99300 8440	00 114500
Pb 10 (0.0) -10.0 10.0 (49.0) 39.	59.0
Mg 5000 255000 216000 294000 248000 2100	00 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 41	7 565
Zn 60 (0.0) -60.0 60.0 952 809	1095

ICSA M5126 M5127 M5128 M5129 M5130

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

value \pm 15 percent of the listed certified value.

ICSB

M5219

M5220

M5221

M5222

M5223

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

> Part Number: 57051 101521 Lot Number:

Description: Antimony (Sb)

Part

Expiration Date: 101524

Recommended Storage: Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

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

> > Dilution

Initial

Uncertainty

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

Lot

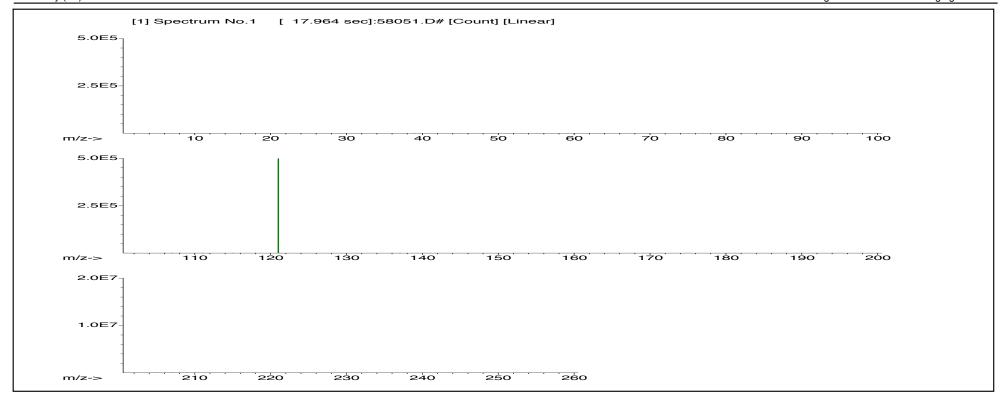
Giovanni Esposito Giovanni Esposito Formulated By: 101521 Reviewed By Pedro L. Rentas 101521

SDS Information

(Solvent Safety Info. On Attached pg.)

Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
 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	3102a

Nominal



Certified Reference Material CRM



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Bu f. Spa

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

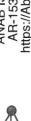
^{*} Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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

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

								-				1					STATE OF THE OWNER, SALES		
							I race M	letals	Verifica	tion	by ICP-N	IS (E	g/mL)						
					MONTH STREET,		STATE OF STREET	THE PROPERTY OF	Photograph and a series of the										
Ι	<0.02	PO	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	ž	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	M	<0.00>
Sb	<0.02	Ca	<0.2	Er	<0.02	Но	<0.02	Lu	<0.02	^Q N	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	: :	<0.0>
As	<0.2	Ů	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	I	<0.02	>	L
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Be	<0.01	ڻ	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Д	<0.02	Ru	<0.02	Sr	<0.02	T	<0.05	>	2002
Bi	<0.02	ပ္	<0.02	Э	<0.02	La	<0.02	Мо	<0.02	Ł	<0.02	Sm	<0.02	S	<0.02	S	<0.0>	, Z	20.02
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				1		No. of Concession, Name of Street, or other Persons and Street, or other P											-	į	20:05

(T)= Target analyte

Certified by:

Physical Characterization:

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



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

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

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

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

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

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Certified Reference Material CRM 20/65



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

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

	S.OE7	m/z-> 1 1.0E8	5.0E7	1.0E8	1.0E6	2.0E6
		110		10		[1] Spectrum No.1
)		200		N O		
N D		130		30		33.272 se
V 2.		140		\$		c]:57038
N .		150		SO		[33.272 sec]:57038.D# [Count] [Linear]
, ,		160		6)		t] [Linear]
		170		70		
		180		80		
		190		90		
		200		100		

Part # 57038



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

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

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		to to	1 5		Be	Da	5	As	00	Cr.	Al	-			
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		C _L	5	3	۲ P	S) ;	ڻ ا	Ca)	2	THE RESERVE AND ADDRESS OF THE PERSON NAMED IN			
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		P .	La		7	4	Н	1	Но	***	H				
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(T)= Target analyte	20.02	3	0.02	2.02	9	40.02	10.05	7	40.02	20.02	202		Verilica	Yank.	CALIFORNIA PROPERTY AND ADDRESS OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN
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	SC	,	Sm	Ru		R F	Rh		P	7			S S	5	
	<0.02	6.01	A 93	<0.02	10.04	200	<0.02	40.04	3	<0.02			g/mL)		
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	<0.02	20.02	3	40.02	20.02		4000	40.02		4002		And the latest designation of the latest des			

(I)= larget analyte

Physical Characterization:

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

Certified by:

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

Part # 57038

the preparation of all standards.

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

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

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

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Certified Reference Material CRM

5288



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CERTIFIED WEIGHT REPORT:

Part Number: Lot Number:

58119 071122

Solvent: 20510011 Nitric Acid

Description:

Expiration Date:

Potassium (K)

Ambient (20 °C)

2%

Nitric Acid

40.0

(mL)

Recommended Storage: Nominal Concentration (µg/mL):

10000

071125

NIST Test Number:

6UTB

5E-05 Balance Uncertainty

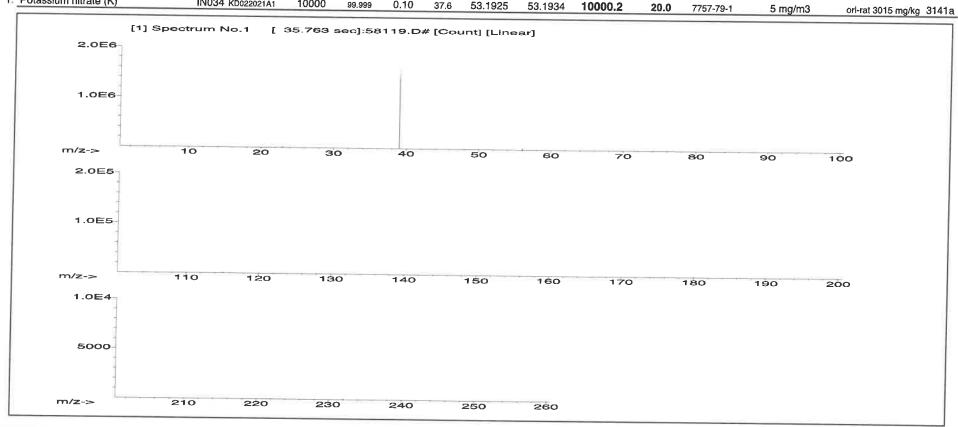
Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

Formulated By: Lawrence Barry 071122 Reviewed By: Pedro L. Rentas 071122

		Lat	Manager	5						Expanded		SDS Information	on	
Compound	D144	Lot	Nominal		Uncertainty	-	Target	Actual	Actual	Uncertainty	(Sol	vent Safety Info. On At	tached pg.)	NIST
- Compound	RM#	Number	Conc. (µg/mL)	(%)	Purity (%)	(%)	Weight (g)	Weight (g)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1. Potassium nitrate (K)	IN034	KD022021A1	10000	99 999	0.10	37.6	52 102E	E2 1024	10000 0	00.0				





Certified Reference Material CRM



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

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

							Trace M	etals	Verifica	atior	by ICP-	MS	(µg/mL)						
AI	<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	TI	< 0.02	l v l	< 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	Yb	< 0.02
Be	< 0.01	Cr	< 0.02	Ga	< 0.02	Fe	< 0.2	Hg	< 0.2	P	< 0.02	Ru	< 0.02	Sr	< 0.02	l Tm l	< 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	T	Sc	< 0.02	Ta	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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

Certified by:

But All

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

Part # **58119**

Lot # 071122

2 of 2

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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

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

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

the analyses.

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

> Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

ICV1-1014

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

Page 1 of 2



RMs ICV 1, 5, 6 SFAM.docx



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

ICV1-1014

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

ICV5-0415

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

ICV6-0400

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

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

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

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

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

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



Certified Reference Material CRM

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

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	The state of the s	Giovanni Esposito	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LDSG	5 mg/m3		
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	Nitric Acid	Nitric Acid	Actual Actual Weight (g) Conc. (ug/mL)	30.0090	160	260
	Lot # 20370011	(mL)	Target Weight (g)	30.0044	150	250
	Solvent:	5.0% srtainty uinty	Assay (%)	100.0		
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]ac	Part Number: Lot Number: Description:	Expiration Date: 020425 Recommended Storage: Ambient (20 Nominal Concentration (µg/mL): 10000 NIST Test Number: 6UTB Weight shown below was diluted to (mL):		1. Iron(III) nitrate nonahydrate (Fe)	[1] Spectr	
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Certified Reference Material CRM



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

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

3533553	Trace Metals Verification by CP-MS (µc 0.02 Li 0.02 Ni 0.010 Ni 0.02 Re 0.02 Li 0.02 Ni 0.02 Re 0.02 Co 0.02 Re 0.02 Co 0.02 Re 0.02 Co 0.02 Co 0.02 Re 0.02 Co 0.03 C	C.O. T. A.O.O. T	Au < 0.02 Pb < 0.02 Nd < 0.03 Pt
Cd <0.02 Ca <0.02 Cs <0.02 Cr <0.02 Cr <0.02 Co <0.10			
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(T)= Target analyte

Physical Characterization:

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



Certified by:

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CERTIFIED WEIGHT REPORT:

Part Number:

57056

Solvent:

20510011

Nitric Acid

8

40.0

Nitric Acid

Description: Lot Number:

072122 Barium (Ba)

Certified Reference Material CRM

Riograph 33

Lot #

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

Formulated By: Liovannie Giovanni Esposito appeal 2

072122

Reviewed By: Pedro L. Rentas 072122

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

1. Barium nitrate (Ba)

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 072125

NIST Test Number:

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

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

Certified Reference Material CRM



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

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Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

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Certified Reference Material CRM



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NIST SRM

Z

CERTIFIED WEIGHT REPORT 1. Cerium nitrate hexahydrate (Ce) Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: m/z-> m/z-> m/z-> 2,5E7-5.0E7 1.0E6-2.0E6-5.0EB-NIST Test Number: Expiration Date: Part Number: Description: Lot Number: [1] Spectrum No.1 [43.472 sec]:58158.D# [Count] [Linear] 210 10 5 IN146 Z512CEB1 24 061322 Cerlum (Ce) 000 061325 57058 Ambient (20 °C) Number 헏 220 120 20 Conc. (ug/mL) 1000.12 Nominal 9 230 130 30 99.999 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Purity 3 Uncertainty Assay Purity (%) 0.10 240 140 6 Solvent 22 3 8 20510011 3.04919 Weight (g) Target 250 S O [0] # 150 20.0 (mL) 3.04923 Nitric Acid Weight (g) Conc. (µg/mL) Nitric Acid Actual 260 160 60 1000.0 Actual 170 70 -/- (µg/m) Reviewed By: Formulated By: Uncertainty Expanded 20 10294-41-4 180 8 (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Lawrence Barry OSHA PEL (TWA) SDS information 190 90 ₹ 200 100 **LD50** ₹ 061322 061322

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

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

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(T)= Target analyte

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Part # 57058

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



Certified Reference Material CRM

R: 03/01/23(12)



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

Solvent: 2110221 Nitric Acid Permulated By: Lawrence Barry D20623 Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry D20623 Cerlum (Co) 1000 Current (20 °C) 1000	Ce) Solvent: 2110221 Nitric Acid Formulated By: Lawrence Barry O20623 (mL) (mL)
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57058 Solvent: 2110221 Nitric Acid 020623 2% 20.0 Nitric Acid 020626 Ambient (20 °C) (mL) Formulated By: Lawrence Barry Ambient (20 °C) (mL) (mL) Reviewed By: Pedro L. Rentas 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Rentas 6UTB 5E-05 Balance Uncertainty Expanded SDS Information	Lot #
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57058 Solvent: 2110221 Nitric Acid Permulated By: Lawrence Barry 020626 Ambient (20 °C) (mL) Nitric Acid Formulated By: Lawrence Barry 4 mbient (20 °C) 1000 6UTB SE-05 Balance Uncertainty Reviewed By: Pedro L. Rentas	Lot #
57058 Solvent: 21110221 Nitric Acid Permulated By: Lawrence Barry 020623 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) (mL) (mL) Mind Acid Mind Acid Mind Acid 6UTB 5E-05 Balance Uncertainty Pedro L. Rentas Reviewed By: Pedro L. Rentas	Lot #
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57058 Solvent: 2110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry Ambient (20 °C) 4mbient (20 °C) (mL) Mitric Acid Formulated By: Lawrence Barry 6UTB 5E-05 Balance Uncertainty Reviewed By: Pedro L. Bentas	57058 Solvent: 21110221 Nitric Acid Pormulated By: Lawrence Barry 020623 2% 20.0 Nitric Acid Formulated By: Lawrence Barry 020626 Ambient (20 °C) (mL) (mL) Manient (20 °C) Manient (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Pedro L. Berrias
57058 Solvent: 2110221 Nitric Acid 020623 200 Nitric Acid Formulated By: Lawrence Barry 020626 Ambient (20 °C) (mL) Ambient (20 °C) Mind (20 °C) 1000 6UTB 5E-05 Balance Uncertainty Barrier Barrier	Lot # Lot # Lot # Solvent: 21110221 Nitric Acid Cerlum (Ce) 2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20 °C) 1000 5E-05 Balance Uncertainty Barriage By: Pacing Barry Barry Barriage By: Pacing Barry Barriage By: Pacing Barry Barriage By: Pacing Barry Barriage By: Pacing Barry By: Pacing
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Compound	RM#	Lot	Nominal Conc. (vg/mL)	Purity (%)	Purity Uncertainty Assay (%) Purity (%) (%)	Assay (%)	Target Weight (g)	Actual Weight (g)	Actual Actual Uncertainty Weight (g) Conc. (ug/mt.) +/- (ug/mt.)	Uncertainty +/- (ug/mL)	SS	(Solvent Safety Info. On Attached pg.) CAS# OSHA PEL (TWA) LD50	ched pg.) LD50	NIST
Cerium nitrate hexahydrate (Ce)	IN146	IN146 Z512CEB1	1000	88.98	0.10	32.8	3.04919	3.04921 1000.0	1000.0	20	II ==	¥.	4 2	ĄN
[1] Spectrum N	lo.1 [43.472	\$ sec]:58158.D#	[1] Spectrum No.1 [43.472 sec]:58158.D# [Count] [Linear]											$\ \cdot \ $
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Certified Reference Material CRM





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

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

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by ICP-MS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.7
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Physical Characterization:

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

(T)= Target analyte

My J. M.

Certified by:

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

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

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

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

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

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number:

Certified Reference Material CRM

7 20 23

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

Lot #

Solvent: 20510011 Nitric Acid

2%

40.0 (<u>l</u>

Nitric Acid

Formulated By:

Giovanni Esposito

011623

Pedro L. Rentas

011623

Giovannie

Jacob P

Description: Aluminum (AI)

011623 58113

Expiration Date: 011626

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

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

Compound ₽ ₩ Number ξ Conc. (µg/mL) Nominal 10000 99.999 Purity Uncertainty Assay 38 Purity (%) 0.10 7.30 8 273.9779 Weight (g) Target 274.0078 Weight (g) Conc. (µg/mL) Actual 10001.1 Actual +/- (µg/mL) Uncertainty Expanded 20.0 7784-27-2 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SDS Information LD50 NIST SRM

1. Aluminum nitrate nonahydrate (Al) IN022 ALM112021A1 m/z-> m/z-> m/z-> 1.0 € 6 2.0 € 6 2.5E6 5.0E6 2.5E5 5.0E5 [1] Spectrum No.1 210 110 0 220 120 20 [15.014 sec]:58113.D# [Count] [Linear] 230 130 30 240 140 40 250 150 50 260 160 60 170 0 180 80 190 90 2 mg/m3 200 100 ori-rat 3671 mg/kg 3101a

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



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

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

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

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

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(T) = Target analyte

Physical Characterization:

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



Certified by:

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

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

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

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

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



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

APPLICATION:

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

CAUTION:

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

the analyses.

Contains 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.

Page 1 of 2





RMs ICV 1, 5, 6 SFAM (1)



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

ICV1-1014

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

ICV5-0415

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

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

	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

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



Certified Reference Material CRM

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

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

2.0% 40.0 Nitric Acid

(III)

Formulated By:

Lawrence Barry

060523

060523

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

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

P20

TSIN SRM

3112a

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

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		190		90		
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Part # 58024



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

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	B	ᄧ	Ве	В	As	Sb	Δ	Monthly		
	A).02	4 0.02	0,01	A .02	40.2	△0.02	△0.02			
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	Æ	ဥ	වූ	ନ୍ଥ	멸	녆	Dy	80		
	40.02	40.02	40.02	<0.02	40.02	40.02	40.02	mineral differences		
	3	Ľ	स्र	Ħ	ď	ᅜ	Ж	SHEET STATES		
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	Sc	Sm	잗	공	Rh	æ	Pr		S (Hi	5
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	Ta	S	ñ	Z.	Ą	Si.	Se			
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	==	Sn	Tm	Ħ	ᄇ	급	176			
	40,02	40.02	40,02	40,02	<0.02	40,02	<0.02	Contract Contraction		
	Zr	Zn	~	뀱	۷	Ϥ	W	可能を経過		
	<0.02	< 0.02	<0.02	<0.02	40.02	40.02	<0.02	SALES OF SALES		

(I)= larget analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

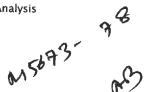
* Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

Sulfuric Acid BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis

Low Selenium









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

Manufactured Date: 2023-03-22

Retest Date: 2028-03-20 Revision No.: 0

Certificate of Analysis

Test	Specification	Result	_
ACS – Assay (H ₂ SO ₄)	95.0 - 98.0 %	96.1 %	_
Appearance	Passes Test	Passes Test	
ACS – Color (APHA)	≤ 10	5	
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm	
ACS - Substances Reducing Permanganate (as SO2)	≤ 2 ppm	< 2 ppm	
Ammonium (NH ₄)	≤ 1 ppm	1 ppm	
Chloride (Cl)	≤ 0.1 ppm	< 0.1 ppm	
Nitrate (NO ₃)	≤ 0.2 ppm	< 0.1 ppm	
Phosphate (PO ₄)	≤ 0.5 ppm	< 0.1 ppm	
Trace Impurities - Aluminum (AI)	≤ 30.0 ppb	< 5.0 ppb	
Arsenic and Antimony (as As)	≤ 4.0 ppb	< 2.0 ppb	
Trace Impurities - Boron (B)	≤ 10.0 ppb	8.5 ppb	
Trace Impurities – Cadmium (Cd)	≤ 2.0 ppb	< 0.3 ppb	
Trace Impurities - Chromium (Cr)	≤ 6.0 ppb	< 0.4 ppb	
Trace Impurities - Cobalt (Co)	≤ 0.5 ppb	< 0.3 ppb	
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb	
Trace Impurities – Gold (Au)	≤ 10.0 ppb	0.5 ppb	
Heavy Metals (as Pb)	≤ 500.0 ppb	< 100.0 ppb	
Trace Impurities - Iron (Fe)	≤ 50.0 ppb	1.3 ppb	
Trace Impurities - Lead (Pb)	≤ 0.5 ppb	< 0.5 ppb	
Trace Impurities – Magnesium (Mg)	≤ 7.0 ppb	0.8 ppb	
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb	
Trace Impurities - Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb	
Trace Impurities - Nickel (Ni)	≤ 2.0 ppb	0.3 ppb	
Trace Impurities – Potassium (K)	≤ 500.0 ppb	< 2.0 ppb	
Trace Impurities - Selenium (Se)	≤ 50.0 ppb	< 0.1 ppb	
Trace Impurities - Silicon (Si)	≤ 100.0 ppb	31.5 ppb	
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb	

>>> Continued on page 2 >>>

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





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

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

For Laboratory, Research, or Manufacturing Use

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



Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



Certified Reference Material CRM

M5697



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

CERTIFIED WEIGHT REPORT:

Part Number:

58029

Lot Number:

102523

Description:

Expiration Date:

NIST Test Number:

Copper (Cu)

Ambient (20 °C)

2.0%

Lot #

24002546

40.0

Nitric Acid Formulated By:

(mL)

Solvent:

Nitric Acid

Reviewed By:

Expanded

+/- (µg/mL)

Pedro L. Rentas 102523

Recommended Storage: Nominal Concentration (µg/mL):

1000

102526

6UTB

5E-05 Balance Uncertainty

Volume shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

Final Uncertainty

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

NIST

3114

Compound

Part Number Number

Dilution Factor

Initial

Uncertainty

Nominal Pipette (mL) Conc. (µg/mL)

1000

Initial Conc. (µg/mL) Conc. (µg/mL)

OSHA PEL (TWA)

Benson Chan

LD50 SRM

102523

1. Copper(II) nitrate trihydrate (Cu)

58129

10

110

100223

20

120

Lot

0.1000

200.0

0.084

10000.1

1000.0

2.2

10031-43-3

CAS#

1 mg/m3 ori-rat 794 mg/kg

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



 $m/z \rightarrow$

5.0E7

2.5E7

m/z->

2.0E7

1.0E7

m/z-> 210 130

30

140

150

50

160

60

170

70

180

80

190

90

200

100

220 230 240

250

260

1 of 2





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

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

0.5			DOM: NO.				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	Тъ	<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	ΰ	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	п	<0.02	v	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	< 0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Ве	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	T	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	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:

Box 1. 8/1

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

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

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

ırt # 58029

Lot # 102523

2 of 2

Printed: 10/26/2023, 1:20:31 PM

Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



Certified Reference Material CRM

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

Lot#

24002546

CERTIFIED WEIGHT REPORT:

Part Number:

58025

102623

Lot Number: Description:

Manganese (Mn)

Ambient (20 °C)

2.0%

60.0

Nitric Acid

(mL)

Solvent:

Nitric Acid

Reviewed By:

Expanded

Formulated By:

102623

102623

Expiration Date: Recommended Storage:

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

6UTB

102626

Balance Uncertainty 5E-05

Volume shown below was diluted to (mL):

3000.41

0.058 Flask Uncertainty

Lot

Dilution

Initial Uncertainty Initial

Uncertainty

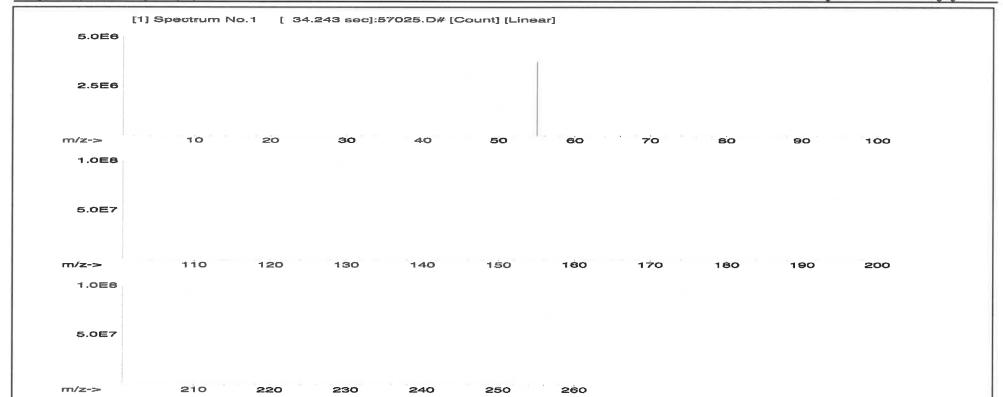
(Solvent Safety Info. On Attached pg.)

SDS Information

Pedro L. Rentas

Benson Chan

Part Nominal Final NIST Compound Number Vol. (mL) Pipette (mL) Conc. (µg/mL) CAS# OSHA PEL (TWA) LD50 Number Factor Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) SRM 1. Manganese(II) nitrate tetrahydrate (Mn) 58125 071123 0.1000 300.0 0.084 1000 10000.1 1000.0 2.1 20694-39-7 5 mg/m3 orl-rat >300mg/kg 3132





Certified Reference Material CRM



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

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

							Trace M	etals	Verifica	tion	by ICP-M	IS (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	Ть	<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	T1	<0.02	l v	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ir.	<0.02	Mn	T	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	< 0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) = Target analyte

Physical Characterization:

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

Certified by:

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

^{*} Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in the balances that are calibrated with weights traceable to NIST (see above).

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

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

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

Absolute Standards, Inc. 800-368-1131

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Certified Reference Material CRM MSTHT

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

CERTIFIED WEIGHT REPORT: Part Number: R: 12/20/23 Lot #

Nitric Acid

Solvent: 24002546

2%

Nitric Acid

Formulated By:

Lawrence Barry

100923

60.0

Lot Number: Description: 57082 100923 Lead (Pb)

Expiration Date: 100926

Recommended Storage: **NIST Test Number:** BIN9 1000 Ambient (20 °C)

Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): 3000.41 0.06 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By:

Cot

Nominal

Purity

Uncertainty Assay

|--|--|--|

Target Weight (a) Con Actual Actual Uncertainty +/- (ua/mL) Expanded #SAC SDS Information
(Solvent Safety Info. On Attached pg.)
(SONA PEL (TWA) TSIN

Pedro L. Rentas

100923

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Part # 57082



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Physical Characterization:

(1)= Target analyte

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

Certified by:

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

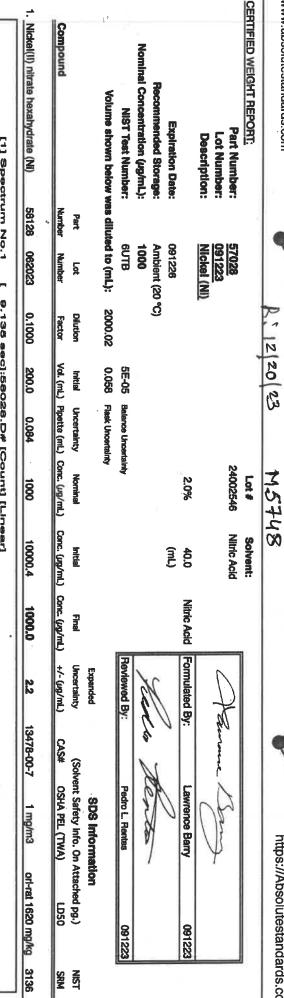
the preparation of all standards.

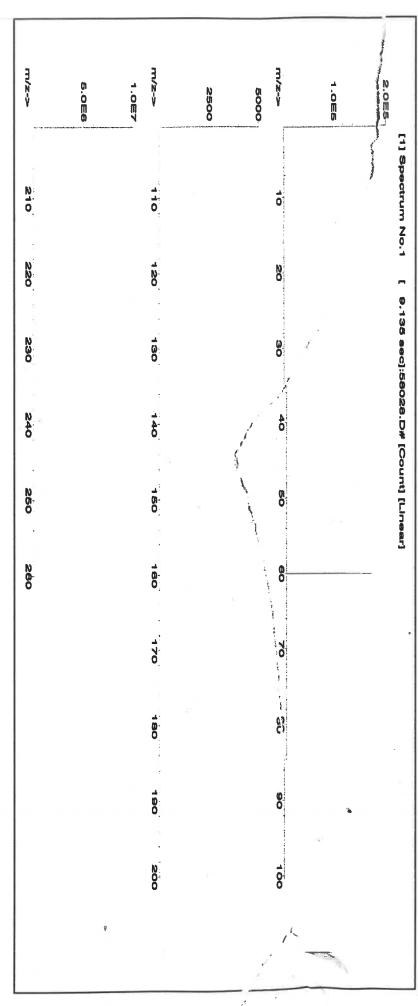
- * Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
 * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
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Certified Reference Material CRM



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





800-368-1131

Absolute Standards, Inc.

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 Kandard.

Certified by:

* The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
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M5768 [M576] (B) R:1/3/24 Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: Magnesium nitrate hexahydrate (Mg) IN030 марозгозат Compound Nominal Concentration (µg/mL): m/z-> M/2-> m/z-> Weight shown below was diluted to (mL): Recommended Storage: 2.0≡4 1.0E4 5.0E5 1.0E6 1000 2000 NIST Test Number: **Expiration Date:** Part Number: Lot Number: Description: [1] Spectrum No.1 110 210 0 쭕 **BTUB** 58112 091823 10000 Ambient (20°C) (M5+18), (M5+16) 091826 Magnesium (Mg) Number 120 ğ 20 [19.923 sec]:58112.D# [Count] [Linear] Conc. (µg/mL) 2000.02 0.058 Flask Uncertainty 10000 Nominal 130 230 30 5E-05 Balance Uncertainty 99.999 Purity Uncertainty Assay 8 Purity (%) (%) 140 0.10 240 40 Solvent: 24002546 Nitric Acid 8.51 150 234.9118 Weight (g) Target Lot # Ē Weight (g) Conc. (µg/mL) 234.9126 Nitric Acid Actual 160 260 0 10000.0 Actual 170 6 +/- (µg/mL) Expanded Uncertainty Reviewed By: Formulated By: 20.0 180 80 13446-18-9 (Solvent Safety Info. On Attached pg.)
OSHA PEL (TWA) LD50 Pedro L. Rentas Lawrence Barry 190 **SDS Information** Ö Z 200 100 orl-rat 5440 mg/kg 3131a 091823 091823 SRM

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

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

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(T) = Target analyte

Physical Characterization:

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

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



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

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

24002546 Nitric Acid

2.0% (IE)

Nominal Concentration (µg/mL):

NIST Test Number:

BTU₉ 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

Expiration Date:

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

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





800-368-1131



Certified Reference Material CRM

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

							Trace Me	etals	Verifical	cation	by ICP-M	S (ua	a/mr)						
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(T) = Target analyte

Physical Characterization:

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

Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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

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122



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

CERTIFIED WEIGHT REPORT:

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

Salvents: 21110221

Nitric Acid Hydrochloric acid

Lot #

22D0562008

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

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

RM#

Number

Conc. (µg/mL) Nominal

(%)

Uncertainty Assay
Purity (%) (%)

Weight (g)

Target

ρţ

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

> 10.0 30.0

3 6%

Nitric Acid

Formulated By:

Benson Chan

071123

Hydrochloric acid

Reviewed By:

Pedro L. Rentas

071123

Weight (g)	ACTUAL	
Conc. (µg/ml.)	Actual Ur	
'- (µg/mL)	certainty	xpanded
CAS# OSHA PEL (TWA) LD50	(Solvent Safety	SUS
PEL (TWA)	y Info. On Attache	Information
LD50	d pg.)	
SRM	TSIN	

1. Ammonium hexafluorostannate(IV) (Sn) m/z-> ---X/m --Z/111 2.5E4 5.0E4 1.0ES 2.0E6 2.5E5 S.OEG [1] Spectrum No.1 210 110 0 IN010 SND042023A1 120 220 N [15.034 sec]:58150.D# [Count] [Linear] 1000 230 130 8 240 140 0.10 40 44.2 250 150 Ö 1.13107 1.13286 160 260 60 1001.6 170 70 2.0 180 80 16919-24-7 190 90 7 mg/m3 200 100 ₹ 3161a

Part # 57050

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(I) = larget analyte

Physical Characterization:

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

Certified by:

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

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

Certified Reference Material CRM

R: 02109124





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

						TANK BURNE	10000	CHICAGO CONTROL CONTRO	URCH LABILLY	ianioc)	(Solvent Safety Into, On Attached pg.)	rttached pg.)	202
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL) C	conc. (ug/ml.)	Conc. (µg/mL)	Conc. (ug/ml.)	+/- (ng/mL)	CAS#	Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)	1050	SRM
Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0	58127	050923	0.1000		0.084	1000	10000	100001	9.0	10008.000	000	700	
							20000		7:5	100c0-22-9	O.UZ ING/ITI3	STEE 10020-22-9 0.02 mg/ms on-rat 691 mg/kg 3113	3113
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		02			
		80		160	
		00		180	
		100		200	

Lot # 091923

250

240

230

220

010

W/Z->

Certified Reference Material CRM





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

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

							Trace M	etals	Verifical	tion	by ICP-M	4S (F	ig/mL)						
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(T)= Target analyte

Physical Characterization:

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



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



Lot # 091923

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

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

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

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Certified Reference Material CRM

M5801



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

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

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Physical Characterization:

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

Certified by:



- * The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated. * Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in
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 * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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Part # 57033

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Certified Reference Material CRM

Solvent: MKBQ8597V Ammonium hydroxide

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

CERTIFIED WEIGHT REPORT: R - 02 00 124 M.5814

Part Number: Lot Number: 57005 071123

Description: Boron (B)

Nominal Concentration (µg/mL): Recommended Storage: 1000 Ambient (20 °C)

Expiration Date:

071126

2.0%

Ammonium hydroxide

Formulated By:

Benson Chan

071123

tento

40.0

Weight shown below was diluted to (mL): 1999.48 0.058 Flask Uncertainty

RM#

Number

Purity (%)

3

NIST Test Number: Ĕ Nominal Purity 5E-05 Balance Uncertainty Uncertainty Assay Target Actual Reviewed By: Expanded Pedro L. Rentas **SDS Information**

071123

1. Boric acid (B) IN018 BV092016A1 Conc. (µg/mL) 100 8 0.10 17.3 11.55772 Weight (g) 11.56201 1000.4 120 10043-35-3 2 mg/m3 orl-rat 2660 mg/kg 3107

Actual +/- (µg/mL) Uncertainty CAS# (Solvent Safety Info. On Attached pg.)
OSHA PEL (TWA) LD50 OSHA PEL (TWA)

NIST SRM

Weight (g) Conc. (µg/mL)

[1] Spectrum No.1 [12.275 sec]:58105.D# [Count] [Linear]

17/Z-V <-Z/111 m/z-> 2.5EG 5.0E6 2.5E6 S.OE6 1.0E4 2.0≡4 110 1210 0 120 220 Ŋ 130 230 30 140 240 40 150 250 (I) O 200 160 60 170 70

180

190

200

80

90

100

Part # 57005

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

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

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Physical Characterization:

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

Certified by:

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- the preparation of all standards.
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R1 02/09/124 Certified Reference Material CRM

M5816

CERTIFIED WEIGHT REPORT

Part Number:

Lot Number: Description:

57016 122923

Solvent:

122923

ASTM Type 1 Water

Lot #

Expiration Date: 122926 Sulfur (S)

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

Recommended Storage:

Ambient (20 °C)

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

Nominal

Purity

Uncertainty Assay

Target

Actual

Uncertainty

Expanded

Reviewed By:

Pedro L. Rentas

122923

tento

Formulated By:

Benson Chan

122923

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

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

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Part # 57016

(I) = larget analyte

Physical Characterization:

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

Certified by:

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

the preparation of all standards.

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Certified Reference Material CRM

109/24

Solvent: 24002546 Nitric Acid

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

CERTIFIED WEIGHT REPORT: M.5818

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

Expiration Date: 122026

2%

Nitric Acid

Formulated By:

Aleah O'Brady

122023

Areah o Brash

Reviewed By:

Pedro L. Rentas

122023

SRM

Œ. 40.0

Nominal Concentration (µg/mL): Recommended Storage: NIST Test Number: **BTU9** 1000 Ambient (20 °C)

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

0.058 Flask Uncertainty

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

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Part # 57014

Lot # 122023



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(T) = Target analyte

Physical Characterization:

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

Certified by:

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

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Certified Reference Material CRM

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Solvent: 24002546

Nitric Acid

F Lot #

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

CERTIFIED WEIGHT REPORT

Part Number: Lot Number: 58030

Description:

111623 Zinc (Zn)

Ambient (20 °C) 111626

Expiration Date:

Nominal Concentration (µg/mL): Recommended Storage:

NIST Test Number:

BTU9 1000

5E-05 Balance Uncertainty 0.06 Flask Uncertainty

Weight shown below was diluted to (mL):

3000.4

5

Nominal

Purity

Uncertainty Assay

Target

Actual

Actual

Uncertainty

Expanded

84 60.0 <u>a</u>

Nitric Acid

Formulated By: Benson Chan

111623

Reviewed By: Pedro L. Rentas

111623

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



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

200

100

Part # 58030

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(I) = larget analyte

Physical Characterization:

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

Certified by:

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Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT: Lot #

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

Formulated By:

Lawrence Barry

091123

Pedro L. Rentas

091123

SDS information

rento

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

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

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

Part # 57015

--z/m

210

220

230

240

250

260



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

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

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Physical Characterization:

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

Certified by:

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

Sodium Chloride, Crystal BAKER ANALYZED® A.C.S. Reagent







Material No.: 3624-01

Batch No.: 0000281938

Manufactured Date: 2021-06-07

Retest Date: 2026-06-07

Revision No.: 1

Certificate of Analysis

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

For Laboratory, Research, or Manufacturing Use Meets Reagent Specifications for testing USP/NF monographs Country of Origin: USA

Packaging Site: Paris Mfg Ctr & DC





Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: WW-LFS-1

 Lot Number:
 T2-MEB723367

 Matrix:
 5% (v/v) HNO3

Value / Analyte(s): 1 000 μg/mL ea:

Potassium,

600 µg/mL ea: Phosphorus,

300 μg/mL ea:

Sodium, Iron,

200 μg/mL ea:

Magnesium, Aluminum, Cerium, Selenium,

Thallium,

100 μg/mL ea:

Lead, Calcium,

80 μg/mL ea: Arsenic,

70 μg/mL ea: Mercury, 50 μg/mL ea: Nickel, 40 μg/ml ea:

40 μg/mL ea: Chromium,

30 μg/mL ea:

Copper, Boron,

Vanadium,

20 µg/mL ea:

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

7.5 μg/mL ea:

Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

Assay Information:

ANALYTE Ag	METHOD ICP Assay	NIST SRM# 3151	SRM LOT# 160729
Ag	Volhard	999c	999c
Ag	Calculated	9990	See Sec. 4.2
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
В	ICP Assay	3107	190605
Ва	ICP Assay	3104a	140909
Ва	Gravimetric	0.10.10	See Sec. 4.2
Be	ICP Assay	3105a	090514
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Се	ICP Assay	3110	090504
Се	EDTA	928	928
Со	ICP Assay	3113	190630
Со	EDTA	928	928
Cr	ICP Assay	3112a	170630
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Na	ICP Assay	Traceable to 3152A	S2-NA700842
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Р	ICP Assay	3139a	060717
P	Acidimetric	84L	84L
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	ICP Assay	3149	100901
Sr	EDTA	928	928
Sr 	ICP Assay	Traceable to 3153a	K2-SR650985
TI	ICP Assay	3158	151215
V	IC Assay	3165	160906
V 7n	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 30, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:	
- Sealed To Fibad Open Dale.	

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Line

Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

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

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Mo	ICP Assay	3134	130418
Sb	ICP Assay	3102a	140911
SiO2	Calculated		See Sec. 4.2
Sn	ICP Assay	3161a	140917
Ti	ICP Assay	3162a	130925

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 17, 2022

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

 Sealed TCT Bag C 	pen Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

20178Ci