

8900, Fax: 908 789 8922

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

Order ID: P4525

Test: Metals CLP Full

Prepbatch ID: PB164451,

Sequence ID/Qc Batch ID: LB133243,

### Standard ID:

MP81119, MP82127, MP82441, MP82442, MP82443, MP82444, MP82445, MP82446, MP82450, MP82451, MP82452, MP82455, MP82455, MP82456, MP82631, MP82632, MP82711, MP82731, M

### Chemical ID:

 $\begin{array}{l} M4960, M5130, M5192, M5218, M5223, M5288, M5289, M5295, M5296, M5390, M5394, M5429, M5467, M5473, M5498, M5513, M5515, M5519, M5634, M5658, M5697, M5698, M5747, M5748, M5769, M5798, M5799, M5800, M5801, M5802, M5806, M5814, M5815, M5816, M5817, M5818, M5819, M5820, M5875, M5935, M5961, M5962, M5970, M5976, M5978, M5982, M5984, M5999, M6021, M6023, M6025, M6028, M6030, M6033, M6037, M6040, M6097, W2606, W3112, M54820, M5876, M5982, M5984, M5982, M5982, M5984, M5982, M5982,$ 



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### **Metals STANDARD PREPARATION LOG**

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

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

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

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





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
902	ICP AES CAL BLK ( SO/ICB/CCB)	MP82441	09/23/2024	10/30/2024	Kareem Khairalla	None	None	09/24/2024

FROM 125.00000ml of M6040 + 2350.00000ml of W3112 + 25.00000ml of M6037 = Final Quantity: 2500.000 ml

Recipe				Expiration	<u>Prepared</u>		<b>-</b> :	Supervised By
<u>ID</u> 2480	NAME ICP AES STD 6 ISM01.3	NO. MP82442	Prep Date 09/23/2024	<u>Date</u> 10/30/2024	<u>By</u> Kareem	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
					Khairalla			09/24/2024

**FROM** 4.00000ml of M5289 + 4.00000ml of M5498 + 4.00000ml of M5515 + 4.00000ml of M5769 + 4.00000ml of M5806 + 30.00000ml of MP82441 = Final Quantity: 50.000 ml



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### Metals STANDARD PREPARATION LOG

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u> 1004	NAME ICPAES ISM01.2 (S5)	NO. MP82443	Prep Date 09/23/2024	<u>Date</u> 10/30/2024	<u>By</u> Kareem	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
1004	1017LE0 101W01.2 (00)	<u>IVII 02440</u>	00/20/2024	10/00/2024	Khairalla	None	Hone	09/24/2024

**FROM** 

0.25000 ml of M5798 + 0.50000 ml of M5429 + 0.50000 ml of M5473 + 0.50000 ml of M5815 + 0.50000 ml of M5817 + 12.50000 ml of M5819 + 12.50000 ml of M5698 + 12.50000 ml of M5806 + 12.50000 ml of M5819 + 13.75000 ml of M5697 + 14.50000 ml of M5515 + 14.50000 ml of M5658 + 14.50000 ml of M6033 + 2.00000 ml of M5513 + 22.50000 ml of M5498 + 22.50000 ml of M5875 + 5.00000 ml of M5896 + 5.00000 ml of M5894 + 5.00000 ml of M5802 + 5.00000 ml of M5818 + 5.00000 ml of M5875 + 303.50000 ml of M782441 = Final Quantity: 500.000 ml

Recipe				Expiration	<u>Prepared</u>	0 1 10	D: (( ID	Supervised By
<u>ID</u> 1005	NAME ICPAES ISM01.2(S4)	NO. MP82444	Prep Date 09/23/2024	<u>Date</u> 10/30/2024	<u>By</u> Kareem	<u>ScaleID</u> None	PipetteID None	Sarabjit Jaswal
	, ,				Khairalla			09/24/2024

FROM 250.00000ml of MP82441 + 250.00000ml of MP82443 = Final Quantity: 500.000 ml





Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1007	ICPAES ISM01.2(S3)	MP82445	09/23/2024	10/30/2024	Kareem Khairalla	None	None	09/24/2024

**FROM** 25.00000ml of MP82443 + 75.00000ml of MP82441 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1008	ICPAES ISM01.2(S2)	MP82446	09/23/2024	10/30/2024	Kareem Khairalla	None	None	09/24/2024

**FROM** 12.50000ml of MP82443 + 87.50000ml of MP82441 = Final Quantity: 100.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe ID 2054	NAME ICV-ICPAES	NO. MP82450	Prep Date 09/23/2024	Expiration Date 10/30/2024	Prepared By  Kareem	<u>ScaleID</u> None	<u>PipetteID</u> None	Supervised By Sarabjit Jaswal	
					Khairalla			09/24/2024	
FROM 0.50000ml of M5218 + 0.50000ml of M5816 + 0.50000ml of M5820 + 0.50000ml of M5970 + 0.50000ml of M5982 + 10.00000ml									

 $0.50000 ml \ of \ M5218 + 0.50000 ml \ of \ M5816 + 0.50000 ml \ of \ M5820 + 0.50000 ml \ of \ M5970 + 0.50000 ml \ of \ M5982 + 10.00000 ml$ of M5295 + 87.50000ml of MP82441 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By
904	ICP AES ICSA SOLN		09/23/2024	10/30/2024	Kareem	None	None	Sarabjit Jaswal
					Khairalla			09/24/2024

**FROM** 25.00000ml of M5130 + 225.00000ml of MP82441 = 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
905	ICP AES ICSAB SOLN	MP82452	09/23/2024	10/30/2024	Kareem Khairalla	None	None	09/24/2024

FROM	25.00000ml of M5130 + 25.00000ml of M5223 + 200.00000r	ml of MP82441 = Final Quantity: 250.000 ml
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Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1119	ICPAES ISM01.2(CCV)	MP82453	09/23/2024	10/30/2024	Kareem Khairalla	None	None	09/24/2024

FROM 0.75000ml of M5498 + 0.75000ml of M5769 + 1.22500ml of M6033 + 1.25000ml of M5515 + 1.25000ml of M5806 + 19.77500ml of MP82441 + 25.00000ml of MP82443 = Final Quantity: 50.000 ml



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### **Metals STANDARD PREPARATION LOG**

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
919	ICP AES INTERNAL STD	MP82455	09/23/2024	10/30/2024	Kareem Khairalla	None	None	09/24/2024

FROM 1.00000ml of M5984 + 10.00000ml of M4960 + 1969.00000ml of W3112 + 20.00000ml of M6037 = Final Quantity: 2000.000 ml

Recipe ID	NAME.	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
903	ICP AES RINSE SOLN	MP82456	09/23/2024	10/30/2024	Kareem Khairalla	None	None	09/24/2024

FROM 200.0000ml of M6037 + 9800.00000ml of W3112 = Final Quantity: 10000.000 ml



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### Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
994	ICPAES ISM01.2 S1 (CONC.)	MP82631	10/02/2024	10/23/2024	Kareem	None	None	
					Khairalla			10/02/2024

**FROM** 

0.02000 ml of M5815 + 0.03000 ml of M5429 + 0.10000 ml of M5798 + 0.10000 ml of M6028 + 0.14000 ml of M5799 + 0.20000 ml of M5473 + 0.20000 ml of M5515 + 0.20000 ml of M5658 + 0.20000 ml of M5801 + 0.20000 ml of M5817 + 0.20000 ml of M5817 + 0.20000 ml of M5817 + 0.20000 ml of M5698 + 0.40000 ml of M6033 + 0.50000 ml of M5697 + 0.50000 ml of M6023 + 0.70000 ml of M5962 + 0.80000 ml of M5961 + 1.00000 ml of M5800 + 1.00000 ml of M5691 + 10.00000 ml of M5806 + 10.00000 ml of M5818 + 10.00000 ml of M5818 + 2.00000 ml of M5978 + 4.00000 ml of M5390 + 34.24000 ml of MP82441 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1003	ICPAES ISM01.2 S1	MP82632	10/02/2024	10/30/2024	Kareem Khairalla	None	None	10/02/2024

FROM 0.50000ml of MP82631 + 87.50000ml of MP82441 = 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 Sarabjit Jaswal
2950	ICP AES S1/CRI STOCK STD	MP82711	10/07/2024	10/31/2024	Kareem Khairalla	None	None	10/07/2024

**FROM** 

0.00300 ml of M6028 + 0.03000 ml of M5798 + 0.05000 ml of M5515 + 0.05000 ml of M5658 + 0.05000 ml of M6030 + 0.05000 ml of M6030 + 0.05000 ml of M6030 + 0.05000 ml of M5697 + 0.10000 ml of M5698 + 0.10000 ml of M5801 + 0.10000 ml of M5820 + 0.10000 ml of M5962 + 0.10000 ml of M5970 + 0.10000 ml of M5982 + 0.15000 ml of M5800 + 0.20000 ml of M5748 + 0.20000 ml of M5799 + 0.20000 ml of M5819 + 0.20000 ml of M6021 + 0.20000 ml of M6023 + 0.25000 ml of M5467 + 0.25000 ml of M5800 + 0.50000 ml of M5390 + 0.50000 ml of M5814 + 1.00000 ml of M5978 + 1.00000 ml of M5816 + 2.00000 ml of M5818 + 77.68000 ml of M582441 = Final Quantity: 100.000 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
921	ICPAES SPIKE SOL#6	MP82731	10/04/2024	10/31/2024	,	METALS_SCA	_	
						LE_2 (M SC-2)	ETTE_3 (A)	10/08/2024

FROM 2.50000ml of M5962 + 50.00000ml of M5990 + 50.00000ml of M5999 + 147.50000ml of MP82441 = Final Quantity: 250.000 ml



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	100721	10/07/2024	10/09/2021 / jaswal	10/08/2021 / jaswal	M4960
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	11/19/2024	05/20/2024 / jaswal	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 /	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	11/19/2024	05/20/2024 / jaswal	04/20/2021 / bin	M5223
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58119 / K, 10000 PPM, 500 ml	071122	07/11/2025	09/01/2022 / jaswal	07/21/2022 / jaswal	M5288



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Aluminum (AI) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	02/05/2025	08/07/2024 / jaswal	02/20/2020 / bin	M5295
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 Opened /	Received Date /	Chemtech
			Date	Opened By	Received By	Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	072122	07/21/2025	08/07/2024 / jaswal	09/18/2022 / bin	M5390
		072122 Lot #		08/07/2024 /	09/18/2022 /	
Standards, Inc.	125 ml		07/21/2025 Expiration	08/07/2024 / jaswal  Date Opened /	09/18/2022 / bin	M5390
Standards, Inc.  Supplier  Inorganic	ItemCode / ItemName  CLPP-CAL-3 / CLP CAL	Lot #	07/21/2025  Expiration Date	08/07/2024 / jaswal  Date Opened / Opened By  11/28/2022 /	09/18/2022 / bin  Received Date / Received By 09/19/2022 /	M5390  Chemtech Lot #



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.	57138 / Sr, 10000 PPM, 125 ml	082922	08/29/2025	03/16/2023 / jaswal	03/16/2023 / jaswal	M5473
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	031523	03/15/2026	08/15/2023 / jaswal	03/17/2023 / bin	M5498
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	061522	06/15/2025	03/19/2023 / bin	03/17/2023 / bin	M5513
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	092122	09/21/2025	08/01/2024 / Jaswal	03/17/2023 / bin	M5515
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
	57119 / Potassium (K)	120822	12/08/2025	01/08/2024 /	03/17/2023 /	M5519



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
PCI Scientific Supply, Inc.	1403 / Hydrogen Peroxide, 30% 1 gal	820803	02/03/2025	04/18/2024 / jaswal	08/03/2022 / Al-Terek	M5634
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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 #
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 /	10/27/2023 / jaswal	M5698
,	500 IIII			jaswal	jaswai	
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
		Lot # 100923	-	Date Opened /	Received Date /	
Supplier  Absolute	ItemCode / ItemName		Date	Date Opened / Opened By	Received Date / Received By	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	091823	09/18/2026	05/24/2024 / Jaswal	01/03/2024 / bin	M5769
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	102523	10/25/2026	02/09/2024 / bin	02/09/2024 / bin	M5798
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	, , , , , , , , , , , , , , , , , , , ,		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
	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier					1	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	122223	12/22/2026	08/01/2024 / Jaswal	01/03/2024 / jaswal	M5806
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute 57005 / B, 1000 PPM, 125 ml		071123	07/11/2026	03/26/2024 / Sohil	01/03/2024 / jaswal	M5814
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute 57115 / P, 10000 PPM, 125 ml		041723	04/17/2026	05/21/2024 / Jaswal	02/09/2024 / jaswal	M5815
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	122923	12/29/2026	05/20/2024 / Jaswal	02/09/2024 / jaswal	M5816
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	071123	07/11/2026	03/01/2024 / jaswal	02/09/2024 / jaswal	M5817
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	122023	12/20/2026	03/06/2024 / jaswal	02/09/2024 / jaswal	M5818



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	111623	11/16/2026	03/20/2024 / jaswal	02/09/2024 / jaswal	M5819
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute 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-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	24D1062002	12/08/2024	06/21/2024 / Al-Terek	06/07/2024 / Al-Terek	M5935
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57028 / Ni, 1000 PPM, 125 ml	041124	04/11/2027	07/02/2024 / Jaswal	06/11/2024 / Jaswal	M5961
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	060624	06/06/2027	07/02/2024 / Jaswal	06/14/2024 / Jaswal	M5962



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	061224	06/21/2027	07/01/2024 / Jaswal	07/01/2024 / Jaswal	M5970
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	-		07/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5976
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic CGTI1-1 / TITANIUM 125mL 1000ug/mL		T2-TI719972	06/17/2027	08/07/2024 / jaswal	02/22/2024 / Jaswal	M5978
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	031524	03/15/2027	07/01/2024 / Jaswal	06/11/2024 / Jaswal	M5982
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Supplier						
Inorganic Ventures	CGY10-1 / YTTRIUM 125mL 10,000ug/mL	V2-Y740548	02/20/2029	08/05/2024 / kareem	06/14/2024 / Jaswal	M5984
Inorganic		V2-Y740548 Lot #	02/20/2029  Expiration Date			M5984  Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	-		07/27/2027	09/04/2024 / Jaswal	02/22/2024 / kareem	M5999
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	, , , , , , , , , , , , , , , , , , , ,		06/24/2027	09/28/2024 / jaswal	08/05/2024 / Jaswal	M6021
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute 57081 / TI, 1000 PPM, 125 ml		0624724	06/27/2027	08/05/2024 / kareem	08/05/2024 / Jaswal	M6023
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute 57082 / Pb, 1000 PPM, 125 ml		061224	06/12/2027	08/05/2024 / Jaswal	08/05/2024 / Jaswal	M6025
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier  Absolute Standards, Inc.	ItemCode / ItemName  57048 / Cd, 1000 PPM, 125 ml	Lot # 070124	-	-		
Absolute	57048 / Cd, 1000 PPM,		Date	Opened By 08/05/2024 /	<b>Received By</b> 01/25/2019 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.			01/16/2026	08/07/2024 / Jaswal	01/03/2024 / Jaswal	M6033
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)		24D1062002	02/02/2025	08/24/2024 / Janvi	08/01/2024 / Janvi	M6037
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical  BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)		24D1562005	02/08/2025	08/09/2024 / jaswal	08/01/2024 / Janvi	M6040
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	Seidler Chemical BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)		03/25/2029	10/24/2024 / Janvi	09/21/2024 / Janvi	M6097
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier Seidler Chemical	ItemCode / ItemName  DIW / DI Water	Lot # Daily Lab-Certified	Date			
			Date	Opened By 10/24/2019 /	Received By 10/24/2019 /	Lot #



Certificate of Analysis

R: 02/22/24 M5986 M5987 M5988 M5989 M5999

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

CLPP-SPK-5

Lot Number:

V2-MEB742037

Matrix:

5% (v/v) HNO3

Value / Analyte(s):

100 µg/mL ea:

Antimony,

50 μg/mL ea:

Selenium,

Thallium,

Cadmium,

40 μg/mL ea: Arsenic,

Alderiie,

20 µg/mL ea: Lead

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Antimony, Sb **CERTIFIED VALUE** 

ANALYTE Arsenic, As **CERTIFIED VALUE** 

40.00 ± 0.26 μg/mL

Cadmium, Cd

100.0 ± 0.7 μg/mL 49.99 ± 0.22 μg/mL

Lead. Pb

19.99 ± 0.09 µg/mL

Selenium, Se

50.00 ± 0.23 μg/mL

Thallium, Ti

50.00 ± 0.22 μg/mL

Density:

1.025 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

ANALYTE	METHOD	NIST SRM#	SRM LOT#
As	ICP Assay	3103a	100818
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Pb	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
Se	ICP Assay	3149	100901
Se	Calculated		See Sec. 4.2
TI	ICP Assay	3158	151215
ТΙ	Calculated		See Sec. 4.2

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

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

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

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

Xi = mean of Assay Method i with standard uncertainty uchar i

w<sub>i</sub> = the weighting factors for each method calculated using the inverse square of the variance;

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

Certified Value, X<sub>CRM/RM</sub>, 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 (±) =  $U_{CRM/RM} = k (u^2_{chara} + u^2_{bb} + u^2_{its} + u^2_{ts})^{1/2}$ 

k = coverage factor = 2

uchar a = the errors from characterization

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

u<sub>lits</sub> = 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)

N/A

### 6.0 INTENDED USE

**6.1** This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures <u>Terms and Conditions of Sale.</u>

<a href="https://www.inorganicventures.com/terms-and-conditions-sale">https://www.inorganicventures.com/terms-and-conditions-sale</a>. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

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

### 7.1 Storage and Handling Recommendations

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

www.inorganicventures.com/TCT

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

March 12, 2024

- 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

- March 12, 2029
- 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.

Paul R Saine

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Joseph Burns Custom VS Manager

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director

Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



## Certified Reference Material CRM

R 815/24

Solvent:

24002546

Nitric Acid

Lot #

M6028

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

CERTIFIED WEIGHT REPORT:

Part Number:

57048 070124

Lot Number: Description:

Cadmium (Cd)

Nominal Concentration (µg/mL):

NIST Test Number:

6UTB

1000

Recommended Storage:

**Expiration Date:** 

070127 Ambient (20 °C)

Weight shown below was dliuted to (mL):

2000.07

0.100 Flask Uncertainty 5E-05 Balance Uncertainty

2%

40.0 (mL) Nitric Acid

Formulated By:

Alban PROBAN

Aleah O'Brady

070124

Reviewed By:

Pedro L. Rentas

070124

Expanded

Weight (g) Conc. (µg/mL) Uncertainty

Cadmium nitrate tetrahydrate (Cd)

IN024 CDM092021A1

1000

99.999

0.10

36.5

5.4797

5.4804

1000.1

2.0

10022-68-1

0.01 mg/m3

orl-rat 60.2mg/kg

3108

RM#

Number Lot

Conc. (µg/mL)

8

8

Weight (g)

Target

Actual

Actual

Nominal

Purity

Uncertainty Assay Purity (%)

+/- (µg/mL)

CAS#

**SDS Information** 

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

**NIST** SRM

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

1 of 2

www.absolutestandards.com

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

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

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### Physical Characterization:

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

Certified by:

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

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

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

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

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

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

Part # 57048

2 of 2



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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

November 02, 2021

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

### 11.2 Lot Expiration Date

- November 02, 2026

- Sealed TCT Rag Open Date:

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

### 11.3 Period of Validity

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

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

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Director, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

Paul R Saines



### 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  $20 \pm 4$  °C)

### **Assay Information:**

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

January 13, 2022

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

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

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

20178Ci

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

www.absolutestandards.com



## Certified Reference Material CRM

R: 8/5/24

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

CERTIFIED WEIGHT REPORT:

Part Number: 57182

Solvent:

24002546

Nitric Acid

Lot#

2%

Nitric Acid

Formulated By:

Lawence Barry

110923

Revenue

1 40.0

Description: Lot Number: 110923 Lead (Pb)

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

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

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

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

Actual Actual

Uncertainty Expanded

Reviewed By:

Pedro L. Rentas

110923

+/- (µg/mL) CAS#

OSHA PEL (TWA) SDS information

# OSHA PEL (TWA) LD50 TSIN SRM

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



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

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

			_		20.02	2	70.02
					3	?	3
<0.02 Pt					40.02	S	40.02
					40.02	, t	20.01
					A.12	S	20.02
			_		A0.02	, E	8 2
					<b>A</b>	<u></u>	20.02
					40.02	. E	20.02
7 7 Z S Z 3	40.02 40.02 40.02	Mg 40.02  Hg 40.02  Hg 40.02	40.02 Lu 40.02 40.02 Mg 40.01 40.02 Mg 40.02 40.02 Mg 40.02	Ho 4002 Lu 4002 Li 4002 Mg 4001 Li 4002 Mg 4001 Li 4002 Mg 402 Fe 402 Hg 402	40.02 Lu 40.02 40.02 Mg 40.01 40.02 Mg 40.02 40.02 Mg 40.02	4002 Ho 4002 Lu 4002 4002 In 4002 Mg 4001 4002 Fe 402 Hg 402	Er 4002 Ho 4002 Lu 4002 Eu 4002 In 4002 Mg 4001 Gd 4002 Ir 4002 Mn 4002 Ga 4002 Fe 402 Hg 402

### Physical Characterization:

(T)= Target analyte

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

Son I Mills

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).

### 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

Dievannie

specific

5%

Nitric Acid

(III) 25.0

> Formulated By: Giovanni Esposito

> > 100721

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

10000

Recommended Storage:

**Expiration Date:** 

100724 Ambient (20 °C)

Weight shown below was diluted to (mL):

500.06

0.058 Flask Uncertainty 5E-05 Balance Uncertainty

RM#

Number Lot

Conc. (µg/mL)

(%)

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/mL)

Target

Actual

Actual

Uncertainty

CAS#

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

NIST SRM

SDS Information

Nominal

Purity Uncertainty Assay

Reviewed By:

Expanded

100721

Pedro L. Rentas

+/- (µg/mL) OSHA PEL (TWA)

5.0E7	. Indium Oxide (In)
[1] Spectrum No.1	IN086 W1096A 10000 99.999 0.10 82.6 6.05408 6.05441
[ 12.965 sec]:57049.D# [Count] [Linear]	10000
sec]:57	99.999
049.D,	0.10
* [Co₁	82.6
ut] [Line	6.05408
ar]	6.05441
	10000.6
	20.1
	1312-43-2
	NA
	NA
	3124a

m/z->	2.5E6	5.0E6	m/z->	1.0E6	2.0E6	m/z->	2.5E7	5.0E7
								[1] Sp
210			110			10		[1] Spectrum No.1
220			120			N O		
230			130			30		965 sec]:57
N 440			140			40		[ 12.965 sec]:57049.D# [Count] [Linear]
N 550			150			50		ount] [Linea
260			160			60		5.
			170			70		
			180			80		
			190			90		
			200			100		



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

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

	-		-				
₩	Bi	Ba	As	Sb	A		
40.02	<b>♦</b> 0.01	40.02	0.2	<0.02	<0.02		
Cı	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 <sub>o</sub>	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 <sub>b</sub>	Rh.	Re	꾸	649	
40.02	A 0.02	<0.02	<0.02	<0.02	<0.02		1
ia o	Sr.	N <sub>a</sub>	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	40.02	<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).





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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

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

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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







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

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

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

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

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

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

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

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

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

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

ICSA M5126 M5127 M5128 M5129 M5130

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

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

**ICSB** 

M5219

M5220

M5221

M5222

M5223

## 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

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

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

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### Physical Characterization:

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

Certified by:

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

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

Part # 57042

2 of 2



### Certificate of Analysis

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CHEM-QC-4

Lot Number: S2-MEB711674

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

3 /0 (V/V) I II

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

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

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

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

### **Assay Information:**

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

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

November 02, 2021

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

### 11.2 Lot Expiration Date

- November 02, 2026

- Sealed TCT Rag Open Date:

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

### 11.3 Period of Validity

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

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

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Director, Quality Control

### **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

Paul R Laine





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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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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.** 

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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.

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APTIM Federal Services, LLC
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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.

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

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

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

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

Element	CRQL	Part A (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	Part A +Part B (µg/L)	Low Limit (µg/L)	High Limit (µg/L)
Al	200	255000	216000	294000	247000	209000	285000
Sb	60	(0.0)	-60.0	60.0	618	525	711
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Ba	200	(6.0)	-194	206	(537)	337	737
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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
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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

3

Certified Reference Material CRM

www.absolutestandards.com

800-368-1131

Absolute Standards, Inc.



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



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

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

Physical Characterization:	Al <0.02 Cd <0.02 Dy Sb <0.02 Ca <0.02 Er As <0.2 Ca <0.02 En Ba <0.02 Cs <0.02 Gd Be <0.01 Cr <0.02 Ga Bi <0.02 Cu <0.02 Ga Bi <0.02 Cu <0.02 Ga	
23 10,002 43	<0.022         Hf         <0.022         Li         <0.022         Ni         <0.022         Pr         <0.02         Se         <0.2         Tb         <0.02         W         <0.02           <0.02	Trace Metals Verification by ICP-MS (ug/ml)

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

Certified by:

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

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

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

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

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

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





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

7	Tb   <0.02   W
_	A 0.02
	3 :
	3 1
	2 :
	Ti <0.02 Zr
	Se <0.2 Si <0.02 Ag <0.02 Na <0.02 Si <0.02 Si <0.02 Ag <0.02 Si <0.02

Physical Characterization:

(I)= larger analyte

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

Certified by:

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

2 of 2



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

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

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

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

the analyses.

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

> Safety Data Sheets Available Upon Request

### (A) SAMPLE DESCRIPTION

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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

ICV1-1014

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

Page 1 of 2



RMs ICV 1, 5, 6 SFAM.docx



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

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

ICV1-1014

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

ICV5-0415

For the cold vapor analysis of mercury by AA, use a 100-fold dilution by pipetting 1 mL of the ICV5 concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and 5% (v/v) nitric acid.

ICV6-0400

For the analysis of cyanide, use a 100-fold dilution by pipetting 1 mL of the ICV6 concentrate into a 100 mL volumetric flask and dilute to volume with Type II water. Distill this solution along with the samples before analysis. The cyanide concentrate is prepared from K<sub>3</sub>Fe(CN)<sub>6</sub>, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

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

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

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number:

57056

Solvent:

20510011

Nitric Acid

200

40.0

Nitric Acid

Description: Lot Number:

072122 Barium (Ba)

Certified Reference Material CRM

Riograph 33

Lot #

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

Formulated By: Liovannie Giovanni Esposito appeal 2

072122

Reviewed By: Pedro L. Rentas 072122

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

1. Barium nitrate (Ba)

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 072125

**NIST Test Number:** 

Recommended Storage:

**Expiration Date:** 

Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

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

## Certified Reference Material CRM



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

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

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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

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

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

All standard containers are meticulously cleaned prior to use.

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

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

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

Certified Deference Metaric Com

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

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

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

Γ						ar]	[ 9.619 sec]:58103.D# [Count] [Linear]	# [C	58103.D	sec]::	_	No.1	ctrum	[1] Spectrum No.1	
5	Byfill 0241 ischin	2					1								
MA	0.10 10.0 100.0134 100.0173 10000.4 20.0 7790-69-4 5 ma/m3 nd-sat 1428 ma/m NA	5 ma/m3	7790-69-4	20.0	10000.4	100.0173	100.0134	10.0	0.10	99.999	10000 89.889 0.	IN019 UZ042018A1	IN019		Lithium nitrate (Li)
SEM	LD50	RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50	CAS#	+/- (ug/mL)	Conc. (ug/mL)	Weight (g)	Weight (g)	(%)	Purity (%)	(%)	Conc. (µg/mL)	Number	RM#		БПроппа
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## Certified Reference Material CRM



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

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

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Physical Characterization:

(T)= Target analyte

Certified by:

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

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

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

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

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## Certified Reference Material CRM

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)
Solvent: 2110221 Nitric Acid   Permulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)   2% 20.0 Nitric Acid   Pormulated By: Lawrence Barry   020623   1000   6UTB   5E-05 Baiance Uncertainty   6UTB   Select Select Control   1000   Color   1000
Solvent: 21110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)   2% 20.0 Nitric Acid   Pormulated By: Lawrence Barry   020623   1000   6UTB   5E-05 Baiarno Uncertainty   5E-05 Baiarno Uncertainty   Actual   Actual
Solvent: 21110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)	Lot #
Solvent: 2110221 Nitric Acid   Permulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)   2% 20.0 Nitric Acid   Pormulated By: Lawrence Barry   020623   1000   6UTB   5E-05 Baiance Uncertainty   6UTB   Select Select Control   1000   Color   1000
Solvent: 2110221 Nitric Acid   Formulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   020623   Cerlum (Ce)
Solvent: 2110221 Nitric Acid   Formulated By: Lawrence Barry   020623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)
Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry   D20623   Cerlum (Ce)	Solvent: 2110221 Nitric Acid   Portun (20°C)   1000   5E-05 Balance Uncertainty   1000.12 0.056 Flesk Unce
Solvent: 2110221 Nitric Acid   Pormulated By: Lawrence Barry (mL)   1000   5E-05 Balance Uncertainty   Expanded   SDS Information   Expanded   SDS Information	Lot #   Lot #
57058         Solvent:         2110221         Nitric Acid         Permulated By:         Lawrence Barry           020623         20.0         Nitric Acid         Pormulated By:         Lawrence Barry           020826         Ambient (20 °C)         (mL)         Pedro L. Rentas           1000         6UTB         5E-05 Balance Uncertainty         Pedro L. Rentas           ediluted to (mL):         1000.12         0.058 Plask Uncertainty         Expanded         SDS Information	57058         Solvent:         2110221         Nitric Acid         Permulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Expanded         SDS Information
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 #
57058         Solvent:         2110221         Nitric Acid           Certum (Ce)         2%         20.0         Nitric Acid         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         50.058 Plask Uncertainty         SDS Information	Lot #
57058         Solvent:         2110221         Nitric Acid           020623         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Formulated By:         Lawrence Barry           4 mbient (20 °C)         (mL)         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         Fedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Fedro L. Rentas	Lot #   Lot
57058         Solvent:         2110221         Nitric Acid           020623         20-110221         Nitric Acid         Pormulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Pedro L Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L Rentas         Pedro L Rentas	Lot #   Lot   Lot
57058         Solvent:         2110221         Nitric Acid         Pormulated By:         Lawrence Barry           020623         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Reviewed By:         Pedro L. Rentas           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas	Lot #
57058         Solvent:         2110221         Nitric Acid         Pedro L. Rentas           020623         20.00         Nitric Acid         Pedro L. Rentas           020626         Ambient (20 °C)         (mL)         Pedro L. Rentas           4 Illuted to (mL):         1000.12         0.058 Pleast Uncertainty         Pedro L. Rentas	Lot #   Lot #
57058         Solvent:         2110221         Nitric Acid         Pedro L. Rentas           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         1000         (mL)         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         Reviewed By:         Pedro L. Rentas           6UTB         1000.12         0.058 Plask Uncertainty         Reviewed By:         Pedro L. Rentas	Lot #
57058         Solvent:         2110221         Nitric Acid           020623         20-110221         Nitric Acid         Pormulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Pedro L. Rentas           4 O0012         5E-05 Balance Uncertainty         Pedro L. Rentas         Pedro L. Rentas	Solvent: 2110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000   6UTB   5E-05 Batance Uncertainty   edituted to (mL): 1000.12 0.058   Pask Unce
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Solvent: 2110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000   6UTB   5E-05 Balance Uncertainty   Illusted to (mL)   1000   100	Lot #   Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000   6UTB   5E-05 Balance Uncertainty   GUTB   SE-05 Balance Uncertainty   GUTB
Solvent: 2110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Multiple (20 °C)   1000   6UTB   5E-05 Balance Uncertainty   Reviewed By: Pedro L. Rentas   Pedro L. Ren	Lot #   Lot #
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 #
57058         Solvent:         2110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         (mL)         Mitric Acid         Formulated By:         Lawrence Barry           4 mbient (20 °C)         1000         6UTB         SE-05 Balance Uncertainty         Pedro L. Rentas	Lot #   Lot #   Lot #   Solvent: 21110221   Nitric Acid   Certum (Ce)   2% 20.0   Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000   SE-05 Balance Uncertainty   SE-05 Balance Uncertainty   Reviewed By: Pedro L. Rentas
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
57058         Solvent:         2110221         Nitric Acid           020623         200         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Mitric Acid         Formulated By:         Lawrence Barry           4 mbient (20 °C)         1000         5E-05 Balance Uncertainty         Bodiest Britishing	57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Ambient (20 °C)         Mind Acid         Formulated By:         Lawrence Barry           6UTB         5E-05 Balance Uncertainty         5E-05 Balance Uncertainty         Bodies I Declaration         Bodies I Declaration
57058         Solvent:         2110221         Nitric Acid           020623         2%         20.0         Nitric Acid           020626         Ambient (20 °C)         (mL)         Formulated By:         Lawrence Barry           4 mbient (20 °C)         1000         1000         1000         1000	57058 Solvent: 21110221 Nitric Acid Certum (Ce)  2% 20.0 Nitric Acid Ambient (20 °C) 1000 6UTB  5F-05 Release Investments
57058         Solvent:         21110221         Nitric Acid           Certum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         4mbient (20 °C)         1000         1000         1000	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000   1000   EF OF THE CENTRAL   C
57058         Solvent:         21110221         Nitric Acid           Cerium (Ce)         2% 20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         1000         Marchian (20 °C)         Marchian (20	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   1000
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         4mbient (20 °C)         Manual Acid         Manual Acid <td< td=""><td>  Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000</td></td<>	Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         4mbient (20 °C)         Mandient (20 °C)         Mandient (20 °C)         Mandient (20 °C)	57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           020626         (mL)         (mL)         Ambient (20 °C)         Manual control of the control o
57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C) </td <td>57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         X         X         X</td>	57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         X         X         X
57058         Solvent:         21110221         Nitric Acid         Permulated By:         Lawrence Barry           020626         Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C) <td>57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         ************************************</td>	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         ************************************
57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         ************************************	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   1000
57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Manual Control	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Manual Control C
57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Mandient (20 °C)         (mL)	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   Minus (mL)
Solvent: 2110221 Nitric Acid   Solvent: 21110221 Nitric Acid   Certum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   (mL)   Formulated By: Lawrence Barry (mL)   Formulated By: Lawrence By: Lawren	Lot #   Lot #
57058         Solvent:         2110221         Nitric Acid           020623         2%         20.0         Nitric Acid           Ambient (20 °C)         (mL)         Formulated By:         Lawrence Barry	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         Control of the contro
57058         Solvent:         21110221         Nitric Acid           020623         2%         20.0         Nitric Acid           020626         (mL)         Formulated By:         Lawrence Barry	57058         Solvent:         21110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)
57058         Solvent:         21110221         Nitric Acid           Certum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)         A	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)   Ambient (20 °C)   Ambient (20 °C)   Ambient (20 °C)   Converse   Co
Solvent: 2110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry   Ambient (20 °C)   Ambient (20 °C)   Ambient (20 °C)   Control of the c	57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         Ambient (20 °C)         Ambient (20 °C)         (mL)         Ambient (20 °C)	57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20°C)         Ambient (20°C)         Ambient (20°C)         Ambient (20°C)         Ambient (20°C)
57058         Solvent:         2110221         Nitric Acid           Cerlum (Ce)         2%         20.0         Nitric Acid         Formulated By:         Lawrence Barry           Ambient (20 °C)         (mL)         (mL)         Ambient (20 °C)         (mL)	Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry   Ambient (20 °C)   Ambient (20 °C)   Ambient (20 °C)   Cerlum (Ce)
57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL) Ambient (20.00)	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)
Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry   Ambise (20.0)   (mL)   Ambise (20.0)   (mL)   Cerlum (Ce)   Cerlum (	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)
57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)	57058 Solvent: 21110221 Nitric Acid  Cerlum (Ce)  2% 20.0 Nitric Acid  Formulated By: Lawrence Barry  (mL)
57058 Solvent: 21110221 Nitric Acid  Certum (Ce)  2% 20.0 Nitric Acid  Formulated By: Lawrence Barry  (mL)	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)
57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)	Lot #   Lot #   Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)
57058 Solvent: 2110221 Nitric Acid Certlum (Ce)  2% 20.0 Nitric Acid (mL)  Formulated By: Lawrence Barry (mL)	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid (mL)  Formulated By: Lawrence Barry (mL)
57058 Solvent: 2110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid (mL)  Formulated By: Lawrence Barry (mL)	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry (mL)
57058 Solvent: 21110221 Nitric Acid  Certum (Ce)  2% 20.0 Nitric Acid  Formulated By: Lawrence Barry  (mL)	Lot #   Lot #   Lot #   Solvent: 21110221 Nitric Acid   Cerlum (Ce)   2% 20.0 Nitric Acid   Formulated By: Lawrence Barry (mL)
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57058 Solvent: 21110221 Nitric Acid  Certum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry  (ml.)	57058 Solvent: 21110221 Nitric Acid  Certum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry  (ml.)
57058 Solvent: 21110221 Nitric Acid  Certum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry  (m)	57058 Solvent: 21110221 Nitric Acid  Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry  (m)
57058 Solvent: 21110221 Nitric Acid  020623 Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry	57058 Solvent: 21110221 Nitric Acid  020623 Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry
57058 Solvent: 21110221 Nitric Acid  Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry	57058 Solvent: 21110221 Nitric Acid  020623 Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry
57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Barry
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57058 Solvent: 21110221 Nitric Acid Certum (Ce)  2% 20.0 Nitric Acid Formulated By:   awrence Berry	57058 Solvent: 21110221 Nitric Acid  Certum (Ce)  2% 20.0 Nitric Acid Formulated By: Lawrence Berry
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57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce)	57058 Solvent: 21110221 Nitric Acid  Cerlum (Ce)  29, 200 Nitric Acid
57058 Solvent: 21110221 Nitric Acid 020623 Certum (Ce)	57058 Solvent: 21110221 Nitric Acid 020623 Cerlum (Ce)
57058 Solvent: 21110221 Nitric Acid 020623 Cerfum (Ce)	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)
57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)	57058 Solvent: 21110221 Nitric Acid Cerlum (Ce)
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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 ==	¥.	<b>4</b> 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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4-103									•					
5.028														
	*	as .												
m/z->	10	20	30		0+		50	9	70		80	100		
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m/2->	110	120	130	0	140		150	160	170		180	190 200		
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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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/mL)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0>	<0.02
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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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Verification	<0.02	<0.02	€0.01	<0.02	402	<0.02	<0.02
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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:

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

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

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.

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

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



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

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

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

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

						Trace Me	tals	Verificat	ioi	by ICP-N	MS (	$(\mu g/m\Gamma)$		r				
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707	ප	<0.02	δ	40.05	H	<0.02	II.	<0.02	Z	<0.02	ď	<0.02	Se	<0.2	13	<0.02	≥	<0.02
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07	ඊ	<b>40.02</b>	超	<0.02	Я	<0.02	Mg	40.01	ő	<0.02	쥪	<0.02	Ag	<0.02	F	<0.02	>	<0.02
707	ర	<0.02	පි	<0.02	片	<0.02	Mn	<0.02	Z	<0.02	2	<0.02	ž	<0.2	Ę	<0.02	¥9	40.02
100	Ö	<0.02	ජි	40.02	Ŗ	<0.2	Hg	40.2	م	<0.02	æ	<0.02	స	<0.02	Ę,	<0.02	¥	₹0.05
707	රි	40.02	පි	₹0.02	3	₹0.02	Wo	<0.02	五	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	2	₹0.02
707	ਰੋ	<0.02	Αū	<0.02	2	<0.02	PN	<0.02	×	40.2	S	<0.02	Ta	<0.02	Ξ	<0.02	Z	40.02
	6.00 6.00 6.00 6.00 6.00 6.00		3 5 5 5 5 5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Cd	Cd	Cd	Cd	Cd	Cd         -60.02         Dy         -60.02         Hf         -60.02         Li         -60.02           Ca         T         En         -60.02         Ho         -60.02         Li         -60.02           Ca         -60.02         Eu         -60.02         In         -60.02         Mg         -60.02           Cr         -60.02         Ga         -60.02         Fe         -60.2         Hg         -60.2           Co         -60.02         Ga         -60.02         La         -60.02         Mo         -60.02           Cu         -60.02         Au         -60.02         Fb         -60.02         Mo         -60.02	Cd         -60.02         Dy         -60.02         Hf         -60.02         Li         -60.02         Ni           Ca         T         En         -60.02         Ho         -60.02         Lu         -60.02         Nh           Ca         -60.02         Eu         -60.02         In         -60.02         Mn         -60.02         Pd           Cr         -60.02         Ga         -60.02         Fe         -60.2         Hg         -60.2         Pr           Co         -60.02         Ga         -60.02         La         -60.02         Rr         -60.02         Rr           Cu         -60.02         Au         -60.02         Pr         -60.02         Rr	Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002           Ca         T         En         -6.002         Ho         -6.002         Lu         -6.002         Nh         -6.002           Ce         -6.002         Eu         -6.002         In         -6.002         Mg         -6.012         Nh         -6.002           Cr         -6.002         Gd         -6.002         Fe         -6.02         Mn         -6.02         Pd         -6.02           Cr         -6.002         Gg         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02           Cu         -6.002         Au         -6.002         In         -6.002         R         -6.002           Cu         -6.002         Au         -6.002         Ph         -6.002         R         -6.002	Cd         -6.002         Dy         -6.002         Hf         -6.002         Li         -6.002         Ni         -6.002         Pr           Ca         T         Ea         -6.002         Ho         -6.002         Lu         -6.002         Nb         -6.002         Rc           Ce         -6.002         Eu         -6.002         Ir         -6.002         Mn         -6.002         Rb         -6.002         Rb           Cr         -6.002         Ga         -6.002         Fe         -6.02         Hg         -6.02         Pr         -6.02         Ru           Co         -6.002         Ga         -6.002         La         -6.002         Rr         -6.002         Rr           Co         -6.002         Ga         -6.002         Pr         -6.002         Rr         -6.002         Rr           Cu         -6.002         Au         -6.002         Pr         -6.002         Rr         -6.002         Sr	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02           Ca         T         Ba         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02           Ce         -0.02         Bu         -0.02         Ir         -0.02         Mg         -0.01         Os         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Mn         -0.02         Pr         -0.02         Rb         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cr         -0.02         Ga         -0.02         Hg         -0.02         Pr         -0.02         Ru         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02           Cu         -0.02         Au         -0.02         Nd         -0.02<	Cd         -d002         Dy         -d002         Hf         -d002         Li         -d002         Ni         -d002         Re         -d002         Si           Ca         T         Ea         -d002         Ho         -d002         Lu         -d002         Nb         -d002         Re         -d002         Si           Ca         -d002         Ea         -d002         Hr         -d002         Mn         -d002         Rh         -d002         Na           Cr         -d002         Ga         -d002         Hg         -d02         Pr         -d002         Ru         -d002         Na           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr           Co         -d002         Ga         -d002         Hg         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr           Co         -d002         Au         -d002         Nd         -d002         Rr         -d002         Sr         -d002         Sr         -d002         Sr         -d002         Ta	Cd         -0.02         Dy         -0.02         Hf         -0.02         Li         -0.02         Ni         -0.02         Pr         -0.02         Se         -0.02           Ca         T         Eu         -0.02         Ho         -0.02         Lu         -0.02         Nb         -0.02         Rb         -0.02         Si         -0.02           Ce         -0.02         Eu         -0.02         In         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Ca         -0.02         Gd         -0.02         Ir         -0.02         Mn         -0.02         Rb         -0.02         Na         -0.02           Ca         -0.02         Ga         -0.02         Hg         -0.02         Ru         -0.02         Sr         -0.02           Ca         -0.02         Ga         -0.02         Hg         -0.02         Rr         -0.02         Sr         -0.02           Ca         -0.02         Au         -0.02         Nd         -0.02         Rr         -0.02         Sr         -0.02           Ca         -0.02         Au         -0.02         Rr         -0.02         Sr	Cd         4002         Dy         4002         H         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Th           Ca         T         Ea         4002         Ha         4002         Lu         4002         Nb         4002         Rb         4002         Tr           Ca         4002         Eu         4002         Ha         4002         Pd         4002         Rb         4002         Tr           Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Ru         4002         Tr          Cr         4002         Ga         4002         Hg         402         Pr         4002         Sr         4002         Tr          Cr         4002         Au         4002         Rr         4002         Rr         4002         Sr         4002         Sr         4002           Cu         4002         Au         4002         Rr         4002         Rr         4002

(T) = Target analyte

### Physical Characterization:

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



Certified by:

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

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

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.

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

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

SRM

1. Lead(II) nitrate (Pb)	INO29 PBD122016A1	10000	88.888	0.10	62.5	32.0006	32.0041 10001.1		20.0	10099-74-8	0.05 mg/m3	intryne-rat 83 mo/kg 3128	3128
1.0E7	[1] Spectrum No.1	17.284 sec]:58182.D# [Count] [Linear]	ec]:58	82.D*	Cour	nt] [Line		1				p h	
S.0E8													
m/z->> 2.0€6	0 P	O		.0		0.00	9	02		08	0	100	
1.0E6													
m/z->	1100	190		04	ri Pr	150	160	170	, T	180	000	000	
5.0ES													
Å	220	230		240		250	260						

Lot # 061522

## Certified Reference Material CRM



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

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

						Ī	Trace Me	stals	Verifica	tion	by ICP-	SM	(ma/m)		,				
Section 1	May be seen and	į	WORNING STREET	Name of Street, or other Persons and Street,	3-5-40. 1. 1. 1. 3-2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	-	THE PROPERTY OF THE PARTY OF TH	CAMPBOOK					2	Commence of the last					
₹	<0.02	ਝ	<0.02	Ď	<0.02	HŁ	<0.02	Ľ	<0.02	ž	<0.02	ď	2002	3	202	4	200		000
Sp	<0.02	ථ	<0.2	ď	200	H	200	ž	969	1	9	è	2000	3	100	2	20.02	*	7mm>
V V	ç	d	1 6	,		2	777	3	70:05	ON T	70.02	2	7070>	7	₹0.02	<u>e</u>	\$0.02	Þ	<b>40.02</b>
ĉ	7.02	3	Z0:02	S S	Q0:05	크	8002	Mg	<b>40.0</b> 1	ර	<b>40.02</b>	Rh	<b>40.02</b>	Ao	<b>CD CD</b>	F	200	2	8
Ba	<0.02	రో	<0.02	3	<0.02	4	<0.02	M	<0.02	Ъ	2002	40	8	0 2	6	į	70:00	- E	70.00
Be	<0.01	Ö	<0.02	S	<0.02	Ę,	402	H	5	. 0	600		7000	2 0	707	= 6	20.02	Q.	<b>40.02</b>
ž	2000	S	200	2	8	-	9 6	9	700	- é	20.02	1	70'05	ă	<b>40.002</b>	Ħ	<b>40.02</b>	×	<0.02
i	200	3 6	70.00	5 .	20.02	3	70:05	WIO	<0.02	Σ,	<0.02	SH	<0.02	S	<0.02	Sn	₹0.02	Z	40.02
	70.02	3	70'02	Au	<0.02	£	T	ž	40.02	×	\$ \$	S	<0.02	Ę	<b>CD 02</b>	Ę	29	2	8

Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 061522

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

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Certified Reference Material CRM

R : 03 | 17 | 12



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

Diovanne

Nitric Acid

Solvent: 20510011

#ioj

Nitric Acid

350.0 (m)

7.0%

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

٠.		
SDS Information	(Solvent Safety Info, On Attached pg.)	L) CAS# OSHA PEL (TWA) LD50
Expanded	Actual Actual Uncertainty	1/- (vg/mL)
	Actual	Conc. (vg/mL)
		_
1	arget	Weight (g)
	Assay	9
1	unity Unkertality Assay	runty (%)
Dringer	runcy (85)	R
Nominal	Conc (un/ml)	COLLEG (ARRYTHL)
ŧ	Number	
	RM#	
	Compound	

5E-05 Balance Uncertainty 0.12 Flask Uncertainty

5000.1

Weight shown below was diluted to (mL):

NIST Test Number:

Ambient (20 °C)

10000 **6UTB** 

092125

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

Iron (Fe) 092122

Description: Lot Number:

Part Number:

CERTIFIED WEIGHT REPORT:

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

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

## Certified Reference Material CRM





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

							Trace Me	stals	Verificat	ion b	y ICP-MS	gu)	/mL)						
STORY .	000			4	200		404				NAME OF TAXABLE PARTY.								
æ	40.02	3	70.05	ŝ	70'0>	Ē	70102	3	Z0702	ž	<0.10	£	<b>₹0.02</b>	š	402	e	<b>40.02</b>	*	40.02
S.	<0.02	రే	<b>4</b> 02	山	<0.02	He	<b>40.02</b>	3	<0.02	ź	<0.02	Re	<0.02	ૹ	<b>40.02</b>	<u>1</u>	<0.02	n	<0.02
As	Ø.2	ප	<0.02	큡	<0.02	멸	<0.02	Mg	<0.01	ő	<0.02	꿆	<0.02	Ag	<0.02	F	<0.02	>	<0.02
Ba	<b>40.02</b>	ඊ	Ø.02	3	<0.02	ㅂ	<b>40.02</b>	Ma	<0.10	몺	<0.02	8	<0.02	Š	40.2	Ē	<0.02	χ.	<0.02
Be	<b>₩</b>	ŏ	<b>40.05</b>	පී	<0.02	£	40.2	Hg	40.2	Δ.	<0.02	Ru	<0.02	Ŗ	<0.02	뎚	<0.02	<b>X</b>	<0.02
Ä	<b>40.02</b>	රි	Ø.10	ප	40.10	ጟ	<b>40.02</b>	Mo	<b>40.02</b>	£	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Z	<0.05
В	<0.02	ರ	<0.10	Απ	<0.02	£	<0.02	R	<0.02	M	<0.2	ß	<0.02	Ta	<0.02	F	<0.02	Z	<0.02

(T)= Target analyte

### Physical Characterization:

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



Certified by:

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

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\* 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.

2 of 2

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## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

Description: Lot Number:

58119 120822 Potassium (K)

Solvent: 20510011 Nitric Acid

Lot #

60.0 <u>a</u>

2%

Nominal Concentration (µg/mL):

NIST Test Number:

**6UTB** 10000 Ambient (20 °C) 120825

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

3000.4

5E-05 Belance Uncertainty

0.06 Flask Uncertainty

Nitric Acid

Formulated By:

Giovanni Esposito

120822

Javanva

アムなるなる

Reviewed By:

Pedro L. Rentas

120822

[1] Spectrum No. 1	Potassium nitrate (K)     INO:	Compound
ZO 1	34 KD022021A1	Lot * Number
TATE TO SE	IN034 KD022021A1 10000 99.999 0.10 37.6 79.7990 79.8075	Lot Nominal Purity Uncertainty Assay Target Actual RM# Number Conc. (µg/ml.) (%) Purity (%) (%) Weight (g) Weight (g) Con
	99.999	Purity (%)
	0.10	Uncertainty Purity (%)
	37.6	Assay (%)
	79.7990	Target Weight (g)
	79.8075	Actual Weight (g)
	10001.1	Actual Conc. (µg/mL)
	10001.1 20.0 7757-79-1	Expanded Uncertainty +/- (µg/mL)
	7757-79-1	(Solv
	5 mg/m3	Expanded SDS Information Actual Uncertainty (Solvent Safety Info. On Attached pg.) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA) LD50
	orl-rat 3015 mg/kg 314	)n tached pg.) LD50
	3141a	NIST

7/2-9	5000	m/z->	1.005	m/z->	1.056	2.016
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N 4. 0		4		Ö.		
N)		<u>.</u> ,				
250 0		<b>5</b> 0		(5) (0)		
N)				4		
260		160		0		
		170		0		
		1				
		180		8		
				,		
		190		8		
		*		•		
		200		100		

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

	Bi Be	
	4000 4000 4000 4000 4000	
	<b>585888</b> 8	
Œ	40.02 40.02 40.02 40.02 40.02 40.02	
	등 유 명 전 함 표 것	
	\$	
	3234483	1.
	402 402 402 402 402	Trace Me
	NA BA BA L L	etals
(T) = Tar	40.00 40.00 40.00 40.00 40.00 40.00 40.00	Verifica
Target analyte	K P P Z O K N	ation
alyte	4022 4022 4022 4022 7	by ICP-
	S B B B B B	SW
	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	(Jm/gu)
	Ja Sr Na Se Se	
	402 402 402 402 402 402 402 402 402 402	
	计划证证证证	
	4000 4000 4000 4000 4000	
	55~\$<□≤	
	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	

### Physical Characterization:

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

Certified by:

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

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

Lot # 120822

### CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

### **CERTIFICATE OF ANALYSIS**

Date: 8/3/2022

MS631 MS632 MS633 MS634

Lot No 820803

### Hydrogen Peroxide, ACS

Reagent Grade

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

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

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

Gina M. Rambo-Office Manager

### 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

 Chromium(III) nitrate nonahydrate (Cr) 58124 Compound Volume shown below was diluted to (mL): NIST Test Number: Number Part **BTU9** 071122 Number Lot 2000.02 0.1000 Factor Dilution Vol. (ml.) Pipette (ml.) Conc. (µg/ml.) 0.058 5E-05 200.0 Initial Flask Uncertainty Balance Uncertainty Uncertainty 0.084 Nominal 1000 Conc. (µg/mL) Conc. (µg/mL) 10000.1 Initial 1000.0 Final Reviewed By: +/- (µg/mL) Uncertainty Expanded 12 7789-02-8 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) Pedro L. Rentas 0.5 mg(Cr)/m3 orl-rat 3250 mg/kg **SDS Information** 

P20

TSIN SRM

3112a

m/z->	N G G	m/z-> 5.0E5	ច.0E5	m/z->	5000	1.0月4
						5
0		110		<b>1</b> 0		III specificini No.
						2
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230		30		0		0
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240		140		0		
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N 50		190		50		
Ŋ		1		0		9
200		160		0		
		170		70		
		0				
		3.		<b>8</b> 0.		
		190		90		
		N O- O		100		

Lot # 060523



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

			_				_			=
The Towner amplied	B	펻	Ве	В	As	Sb	Δ	Monthly		
	40.02	A).02	<b>40.01</b>	<b>40.02</b>	40,2	40.02	<0.02			
	δ	ප	유	Č	ප	ಧ	Ω			
	<b>40.02</b>	A),02	<b></b> -)	40.02	40.02	40,2	△0.02			
	Æ	န	ရှု	ව	퍌	Ħ	Dy	50		
	<b>40.02</b>	40.02	40.02	40.02	<0.02	<0.02	<0.02			
	끃	<u>r</u>	ਸ਼	Ħ	Ħ	ᅜ	Ж	Short Street		
	<b>40.02</b>	40.02	40.2	A).02	<0.02	0.02	40.02		I race M	7
	圣	š	ВH	Ķ	₩	Į.	Е	MINION SERVICE	Metals	1
	A),02	40.02	40.2	<b>40.02</b>	40,01	<b>∆</b> .02	40.02	SI RECEIPTOR	Verification	
	~	7	70	2	ဝွ	₹	Z	SHOWING THE	Clon	
	<b>∆</b> 0.2	<b>0</b> ,02	40.02	40,02	40.02	40.02	<0.02	THE REAL PROPERTY.	by ICP-M	
	Sc	Sm	잗	뫊	Rh	æ	P			5
	<0.02	40.02	40.02	40.02	40,02	40.02	<0.02		g/mL)	
	Ta	S	ş	Z.	Ag	Si.	%			
	40.02	40.02	40.02	402	<b>40.02</b>	40.02	<b>402</b>			
	=======================================	Sn	Ħ	₽	ᄇ	귿	Tb			
	40,02	40.02	40,02	40,02	<0.02	40,02	<0.02	Contract Contraction		
	Zr	Zn	~	뀾	۷	Ϥ	W			
	<0.02	<0.02	<0.02	<0.02	<0.02	40.02	<0.02			

(I)= larget analyte

### Physical Characterization:

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

Certified by:

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

the preparation of all standards.

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

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

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

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

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

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



### Certified Reference Material CRM

M5697 B: 10/27/23

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

CERTIFIED WEIGHT REPORT:	l=						Lot #	Solvent:						L:
Pe	Part Number: Lot Number: Description:	O look life	58029 102523 Copper (Cu)	9			24002546	Nitric Acid				M		
							2.0%	40.0	Nitric Acid	Formulated By:	šy:	Benson Chan	102523	
Exp	Expiration Date:		102526	2				(mL)		,	0	D		
Nominal Concentration (µg/mL):	ion (µg/mL):	<u></u> >	1000	S						M	N	tento		
NIST T	NIST Test Number:	0	втв		5E-05	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	102523	
Volume sh	Volume shown below was diluted to (mL):	diluted	1 to (mL):	2000.02	0.058	Flask Uncertainty	ч							ū
										Expanded		SDS information	tion	
Compound	Z	Part	Lot	Dilution	Initial Vol. (ml.)	Uncertainty Pipette (ml.)	Nominal	Initial	Final	Uncertainty	(Solv	(Solvent Safety Info. On Attached pg.)	Attached pg.)	NIST
					von (mr.)	son (min) s species (min)	Const. (Agrant)	Course (Jage cont.)	Course (hgy min.)	the Organization	COLON	(1117)	E-30	Civia
Copper(II) nitrate trihydrate (Cu)		58129	100223	0.1000	200.0	0.084	1000	10000.1	1000.0	20	10031-43-3	1 mg/m3	ori-rat 794 mg/kg	3114
1.0E6	[1] Spectrum No.1	Z	_	3.422 s	əc]:58	)29.D# [C	33.422 sec]:58029.D# [Count] [Linear]	near]	en.					
									The Park of the Annual Control of the Annual					
5.OE5									nerhetileren hete ekstervicht vickspilvingsk					
m/z->	10		N O	30	12 12	4	50		7		B)	90	0	
5.0E7														
2.567														
m/z->	110		120	130		140	150	160	170		180	190	200	
2.067														
1.027														
m/z->	210		220	230		240	250	260						

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

		_				_		Comments.	-
	Ľ	<u>в</u>	Ве	Ва	As	Sb	Δ		
	20.02	8.00	10.0	40.02	402	40.02	40.02		
	2	, ზ	υ	င္ပ	ပ္ပ	δ	8		
	-	<0.02	<b>40.02</b>	<0.02	<0.02	40.2	<0.02		
	Au	Š.	Ç	£	멸	य	Dy		
	<0.02	40,02	<0.02	<0.02	<0.02	40.02	40.02		
	3	F	팖	=	Ы	Но	Ħ		
	40.02	<b>40.02</b>	40.2	△0.02	<0.02	<0.02	40.02		Trace M
	Nd	Мо	Hg	M	Mgg	Lu	<u> </u>		letals
(T) = Target analyte	A0,02	<0.02	40.2	40.02	10.05	40.02	40.02		Verifica
et anal	×	7	ק	Ъ	တ္တ	3	Z		<del>-</del>
vie	40.2	40.02	40.02	40.02	40.02	<0.02	<0.02	27 101	-4-10-14 
	&	Sm	Ru	짱	Rh	Re	Pr	c	
	40.02	<0.02	40.02	A).02	40.02	<b>6</b> 0.02	40.02	g/ 1111L/	
	Ta	Ø	Sr	Z	Ag	S:	Š		
	40,02	<0.02	40.02	40.2	40.02	<b>40.02</b>	40.2		
	77	Sn	F	Ħ	::	Te	급		
	40.02	40.02	40.02	40.02	40.02	<0.02	40.02		
	Zr	25	ĸ	<b>¥</b>	<	ď	W		
	<0.02	40.02	<b>40.02</b>	40.02	40.02	<b>∆</b> 0.02	<b>₹0.02</b>		

#### 1.1

#### Physical Characterization:

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

#### Certifled by:

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

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

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

ırt # 58029

2 of 2

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

www.absolutestandards.com



### Certified Reference Material CRM

M5648 8: 10/23/23

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

CERTIFIED WEIGHT REPORT: 1. Manganese(II) nitrate tetrahydrate (Mn) Compound Nominal Concentration (µg/mL): m/z-> m/z-> M/Z-V 5.OE7 1.0≣8 5.0厘7 1,0E8 2.5E6 5.0E6 Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: [1] Spectrum No.1 Lot Number: Description: 110 210 0 58125 Number Part 58025 102623 **BTUB** 1000 Ambient (20 °C) 102626 Manganese (Mn) 071123 120 Number 20 Ĕ [ 34.243 sec]:57025.D# [Count] [Linear] 3000.41 0.1000 Factor Dilution 130 30 Vol. (mL) Pipette (mL) Conc. (µg/mL) 300.0 0.058 5E-05 Initial Flask Uncertainty Balance Uncertainty 240 140 Uncertainty 40 0.084 24002546 Nominal 2.0% Lot # 1000 250 150 00 Conc. (µg/mL) Conc. (µg/mL) Nitric Acid Solvent: 10000.1 Initial <u>a</u> 60.0 260 160 00 Nitric Acid 1000.0 Final 170 0 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Expanded <u>2</u> 180 80 20694-39-7 CAS# (Solvent Safety Info. On Attached pg.) 190 OSHA PEL (TWA) 90 Pedro L. Rentas Benson Chan SDS Information 5 mg/m3 200 100 ort-rat >300mg/kg D50 102623 102623 3132 SRM

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



		-	_		_	_		
	B	Bi	Be	Ва	As	Sb	Δ	
	40.02	0.02	40.01	<0.02	40.2	40.02	<b>4</b> 0.02	
	δ	င္ပ	δ	ဂ္ဂ	ဂ္ဂ	ប្	δ	
	<b>40.02</b>	<0.02	<0.02	<0.02	<0.02	40.2	40.02	
	Au	န္	ටු	Æ	달	뻙	Ŋ	
	40.02	<0.02	40.02	40.02	<0.02	<0.02	<0.02	
	PB	7	æ	. <b>타</b>	Ħ	Но	Ħ	
	40.02	40.02	40.2	40.02	A0.02	A0.02	40.02	Trace M
	M	Mo	Ж	M	Mg	Ę	Ľ	letals
Tamet analyte	40,02	<b>6.02</b>	40.2	H	40.01	40.02	<0.02	Verifica
or or or	×	7	ֿס	Pd	õ	3	Z	tion
1	40.2	<b>∆0.02</b>	<0.02	<0.02	40.02	<0.02	<0.02	by ICP-N
	Sc	Sm	Ru	æ	공	<b>₽</b>	27	S (µ
	<0.02	<b>&lt;0</b> .02	<0.02	<0.02	<0.02	<0.02	<0.02	g/mL)
	Ta	S	Sr	Z,	Ag	Si	જ	
	40.02	<b>∆</b> .02	<0.02	02	40.02	A).02	40.2	
	11	S	Tm	Ħ	∄	귾	41	
	40.02	<0.02	40.02	40.02	40.02	40.02	40.02	
	Zr	Zn	۲	\$	<	<b>-</b>	¥	
	40.02	A 0.02	40.02	△0.02	∆0.02	40,02	<0.02	

(I) = larget analyte

#### Physical Characterization:

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

Certified by:

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

<sup>\*</sup> 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).

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

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

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

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number: **Lot Number:** Description:

57082 100923 Lead (Pb)



Certified Reference Material CRM

MSTHT

R: 12/20/23

Lot #

Solvent: 24002546 Nitric Acid

2% 60.0 Nitric Acid

1000 Ambient (20 °C)

Recommended Storage:

**Expiration Date:** 

100926

Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): **NIST Test Number: BTU9** 3000.41 0.06 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By:

Lot

Nominal

Purity

Uncertainty Assay

**PV#** Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Conc. (µg/mL) +/- (µg/mL) CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) SRM

Formulated By: Lawrence Barry 100923

Target Actual Actual		SDS Information
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E.	expanded	SPS INDINSTRUCT
Assay Target Actual Actual Lin		Column Cofety Into On Attacked on

		÷
1.055		1. Lead(II) nitrate (Pb)
	[1] Spectrum No.1	IN029 PBD122016A1
	14.144	1000 99.999 0.10 62.5 4.80071 4.80077
	8ec]:58	88.88
	082.D	0.10
	#[Cou	62.5
	nti [Line	4.80071
		4.80077
		1000.0
		2.0
		10099-74-8
		0.05 mg/m3
		intryns-rat 93 mg/kg
		3128

m/z->	1.0E6	₽.OE6	m/z->	5.0E4	1.0∈5	m/z->	5.0M4	1.0E5
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022			120			N O		
to.								
200			130			30		
240			140			40		
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250			150			<b>5</b> 1		
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			170			6		
			180			80		
			Ö.			o .		
			190			90		
			200			00		
			200			100		

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Z	Mo	H9	M	<u>M</u>	` <u>[</u>	7	E	i	tals	-
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K	7	7	P	Ç	N	1	Z		tion	١
402	<0.02	40.02	40.02	40.02	20.02		40.02		by ICP-I	
Sc	Sm	R	중	꺔	8	:	Ŗ		S S	ı
<0.02	<0.02	<0.02	<0.02	40.02	20.02	000	40.02	ľ	Jig/mL)	
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Ti	Sn	Tm	Ħ	Ħ	Te	5				
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Zr	Zn	×	44	۷	c	4	W			
₫,02	40.02	₫.02	△0.02	40.02	40.02	20.02	2003			

### 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.

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

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):

	1	-		-	-		-	-		-	-	T	9		=
		В	10	<u> </u>	Be	Ba	1	As	30	3	2		ı		
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		<b>∆</b> 002	<0,02	20.02	3	<b>602</b>	70,02	3	A),02	20.02	2000				
	Ì	3	7	17	<u>F</u>	<u>-</u>	In	7	뚱	111	Ę	THE SAME			
		<b>∆</b> 0.02	0.02	, C	3	<u> </u>	20.02	3	<u>&amp;</u>	20.02	2000		I acc is	200	
		Z.	₹	200	7	¥	Z.		Ε.	5			Icrais	0+0	
3		\$	88	2.0	200	<b>A</b>	<u>0.01</u>		A)(2)	20.02	200		ACTILICA		
Target	r	<b>*</b>	7	he	, ;	론	S	, ;	Ş	2		I		<u>†</u>	I
arialyte	1	3	<b>A</b>	40,02	20.02	3	<0.02	2000	200	Н			DY ICE-N	7: 53 P	
	۶	9 -	î	R	2	ş	곧	7	9	7			20	2	
•	20.02	3 6	A 3	<b>∆</b> 0.02	20.02	3	& 80 80 80	70.02	3	۵.02		ľ	9/mL)	/	
	I a	3 6	^	ş	N	1	Αg	2	?	જ		ı			
	20,02	68	3	<u>&amp;</u>	8	> 1	<b>A</b>	20.02	3	40.2	AND TON	MICHIGAN NO.			
		1 1	?	ď	Th	1 :	-1	Ie.	3	7					
	40,02	20.02	3	<b>40.02</b>	40.02	6.01	3	20.02	100	4000					
	72	4	₹,	<u> </u>	5	•	<	_	: :	Ø	N. Control				
	<0.02	20.02	600	3	<b>6002</b>	20.02	3	<b>∆</b> .02	200	2000					

#### 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.
\* Printed acids, 18.2 megohm delonized water, calibrated Class A glassware and the highest purity raw materials are used in

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

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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).



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



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

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

	555	В	Ве	Ва	As	Sb	A		
						_			
	∆0.02	0.02	40.01	<0.02	<b>60.2</b>	<0.02	<0.02		
	Ĉ.	ဝ	Ω	Ŝ	ද	ದ್	Ω		
	<b>∆</b> 0.02	<0.02	<0.02	<0.02	40.02	40.2	<0.02		
	Αu	င္စာ	က္အ	8	탇	耳	Dy		
	<b>₹0,02</b>	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
	73	L <sub>a</sub>	Fe	F	In I	Ho	Hf		ı
	<0.02	40,02	40.2	<0.02	<0.02	<0.02	<0.02	I acc	-1
	Z.	Mo	Hg	Mn	Mg	ŗ	5	Mergis	2
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(1) = larget analyte

#### Physical Characterization:

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

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



### Certified Reference Material CRM



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

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

24002546 Nitric Acid

2.0% (IE)

Nominal Concentration (µg/mL):

NIST Test Number:

BTU<sub>9</sub> 1000

Volume shown below was diluted to (mL):

2000.02

0.058

Flask Uncertainty Balance Uncertainty

5E-05

Number

Number Lot

Vol. (mL.)

Part

Dilution Factor

hitia

Uncertainty

Recommended Storage:

Ambient (20 °C) 102526

**Expiration Date:** 

Lot Number: Description:

Beryllium (Be)

40.0

Nitric Acid

Benson Chan

102523

Formulated By:

Reviewed By:

Pedro L. Rentas 102523

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





800-368-1131



### Certified Reference Material CRM

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

							Trace M	etals	Verificat	cation	by ICP-M	(J) S	ua/mL)						
	TATES AND AND		District Color	STATE OF THE PERSON		Section and		SOMETHINGS.	NAME OF STREET	SAMOOGE STATE	SECOND SPINSO	No. of Lot	. 18						
F	<0.02	3	<0.02	Ďλ	<0.02	HL	<0.02	Li	<0.02	z	<0.02	Ā	<0.02	Se	<0.2	T.	<0.02	M	<0.02
Sp	<0.02	ථ	<b>40.2</b>	占	₹0.02	He	<0.02	3	<0.02	£	<0.02	Re	<0.02	Š	<0.02	ę	₹0.02	Þ	<0.02
As	<0.7	ඊ	<0.02	립	₹0.02	ដ	<b>₹0.02</b>	Mg	10.0>	ő	<0.02	Rh	<0.02	Ag	<0.02	F	<0.02	>	<b>40.02</b>
Ba	<0.02	ర	<0.02	3	<0.02	ㅂ	<0.02	Mn	<0.02	2	<0.02	8	<0.02	ž	40.2	Ħ	<0.02	2	<0.02
æ	Т	ర	<b>40.02</b>	ő	<b>40.02</b>	£	<0.7	Hg	<02	Δ,	<0.02	Ru	<0.02	š	<0.02	Tm	₹0.02	×	<b>40.02</b>
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æ	<0.02	ರೆ	<0.02	Au	<0.02	£	₹0.02	PK	<0.02	M	<0.2	S	<b>40.02</b>	Ta	<0.02	F	<0.02	Z	<b>40.02</b>

(T) = Target analyte

#### Physical Characterization:

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

#### Certified by:



All standard containers are meticulously cleaned prior to use.

2 of 2

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

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

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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



#### 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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	* > > \$ × 2 ×	
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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

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.)	ttached pg.)	202
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL) C	conc. (ug/ml.)	Conc. (µg/mL)	Conc. (ug/ml.)	+/- (ng/mL)	CAS#	Number Number Factor Vol. (mL) Pipette (mL) Conc. (µg/mL) Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)	1050	SRM
Cobatt(II) nitrate hexahydrate (Co) 58127 050923 0.1000 200.0	58127	050923	0.1000		0.084	1000	10000	100001 100001	9.0	10008.000	000	700	
							20000		7:5	100c0-22-9	O.UZ ING/ITIS	STEE 10020-22-9 0.02 mg/ms on-rat 691 mg/kg 3113	3113
2000	Z Ezz	1.0	9 4 DAG 45	Cau. Co	CHARLE WO	[1] Specifical No.1 Cat. 04.04% pool: nacotation of the partition of the p							

1.0E6	5.0E5	m/z->	5.0E7	1.0E8	5.0E7
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L 34-243 Secj.baok7.D# [Count] [Linear]		Ō		130	
		.0		140	
		.09		150	
		. <b>O</b>		160	
				170	
		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)						
1							STREET, STREET	No section lives	ALL DESCRIPTION OF THE PERSON	10.000	Market Mark	MINNSH.	San Salar Salar	NAME OF TAXABLE PARTY.	Service of the last	SECOND SECOND		THE PERSON NAMED IN	STREET, SQUARE,
IV	<0.02	ಶ	1	Š	40.02 Dy 40.02	Ħ	<0.02	П	<0.02	Z	<0.02	Æ	<0.02	B	<0.2	£	<0.02	A	<0.02
ౙ	<b>40.02</b>	రే	<b>40</b> 7	占	<0.02	H9	<0.02	.3	₹005	Ź	₹0.02	2	<0.02	Š	40.02	T <sub>e</sub>	40.05	ם	40.02
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2	¥0.01	ඊ	<b>20.02</b>	త్ర	<b>40.02</b>	હ	40.2	쁀	\$ 20	تم	₹0.02	콥	40.02	Şt	<b>40.02</b>	Tm	Ø.02	7	Ø.02
遥	<b>40.02</b>	රි	۳	Ğ,	<b>4002</b>	ដ	<0.02	Mo	<b>40.02</b>	Æ	<b>20'0</b> >	S	<0.02	S	<b>40.02</b>	Sn	40.02	Zn	Ø.02
æ	<0.02	ට්	<0.02	Αn	<0.02	윤	Z0'0>	P	<0.02	м	40.2	S	<0.02	Fee Fee	<b>40,02</b>	Ħ	Ø.02	72	Ø.02

(T)= Target analyte

#### Physical Characterization:

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



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Lot # 091923

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#### 02/00/24 Certified Reference Material CRM

W 580



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

CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: NIST Test Number: Expiration Date: Part Number: Description: Lot Number: 57033 111323 Arsenic (As) **BTUB** 1000 111326 Ambient (20 °C) 5E-05 Balance Uncertainty 24002546 Lot# 2.0% Nitric Acid Solvent: 80.0 Nitric Acid Formulated By: Reviewed By: Therence Pedro L. Rentas Lawrence Barry

1. Arsenic (As)

58133

020522

0.1000

400.0

0.084

1000

10001.0

1000.0

2.0

7440-38-2

0.5 mg/m3

orl-rat 500 mg/kg 3103a

Number Part

Number Lot

Vol. (mL)

Pipette (mL) Conc. (µg/mL)

Conc. (µg/mL) Conc. (µg/mL)

+/- (µg/ml.) Uncertainty Expanded

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

LD50

NIST SRM

SDS Information

111323

111323

Dilution Factor

initial

Uncertainty

Nominal

Initial

Final

Compound

Volume shown below was diluted to (mL):

4000.0

0.06

Flask Uncertainty

-z/x->	500	m/z->	N IN IN	m/z-> 5.0≣4	1.0厘5	≥.005
						3
Ŋ		110		ō		[] Speatrum No.1
						Z 0.1
N N N O		120		N.		á
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		A second		es Alba de la casa de		90]:570
240		140		ò		33.D#
N 0		-i-		50		[Count]
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	40.02 40.02 40.02 40.02 40.02		

#### Physical Characterization:

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

Certified by:



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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) 9 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

Printed: 2/8/2024, 5:01:07 PM

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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get ana	× P P Z Q B Z	ation	
lyte	40.02 40.02 40.02 40.02 40.02	by ICP	
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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.
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Certified Reference Material CRM

R102109124

MURIC

Solvent: 21110221

Nitric Acid

Lot #

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

CERTIFIED WEIGHT REPORT:

Part Number: **Lot Number:** 

57115 041723

Description:

Phosphorous (P)

**Expiration Date:** 

041726

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

**BTUB** 

5E-05 Balance Uncertainty

Weight shown below was diluted to (mL): 2000.02

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

1. Ammonium dihydrogen phosphate (P)

IN008 PV082019A1

10000

99,999

0.10

27.5

RM#

Compound

22%

40.0

Nitric Acid

Formulated By:

Lawrence Barry

041723

into

Reviewed By:

Pedro L. Rentas

Expanded SDS Information 041723

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

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

Part # 57115

1 of 2

	Γ						, .		Г	
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	<b>∆</b> 0,02	40,02	<b>6</b> 22	40.02	40.02	40.02	<b>40.02</b>		Trace Me	
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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).

2 of 2

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

M5816

CERTIFIED WEIGHT REPORT

Part Number:

Lot Number: Description:

57016 122923

Solvent:

122923

**ASTM Type 1 Water** 

Lot #

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

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

Recommended Storage:

Ambient (20 °C)

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

Nominal

Purity

Uncertainty Assay

Target

Actual

Uncertainty

Expanded

Reviewed By:

Pedro L. Rentas

122923

tento

Formulated By:

Benson Chan

122923

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

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

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

(I) = larget analyte

#### **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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\* 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

109/24

M5817

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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 071123 57116

Solvent:

071123

**ASTM Type 1 Water** 

Burense

Formulated By:

Lawrence Barry

071123

Lot #

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

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

Recommended Storage:

EU1B

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

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

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

Expanded

071123

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

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Physical Characterization:

(1)= larger analyte

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

Certified by:

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  \* 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

109124 M.5818

Solvent: 24002546 Nitric Acid

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

CERTIFIED WEIGHT REPORT:

Part Number:

Lot Number: Description: 57014 122023

Silicon (SI)

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

**Expiration Date:** 

122026

2%

40.0 (mL)

Nitric Acid

Formulated By:

Aleah O'Brady

122023

122023

Areah o Brasky

Compound			Weight shown below was diluted to (mL): 1999.48 0.058 Flask Uncertainty	NIST Test Number	The second secon
RM#			elow was diluted	Number:	
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(%)	Purity		0.058	5E-05	
Purity (%)	Nominal Purity Uncertainty Assay		Flask Uncerta	5E-05 Balance Uncertainty	
8	Assay		unty	artainty	
Weight (g)	Target				
Weight (g)	Actual				
Conc. (ug/mL)	Actual				
+/- (ug/mL)	Uncertainty	Expanded		Reviewed By:	/
CAS#	(Solve				
OSHA PEL (TWA)	Lot Nominal Purity Uncertainty Assay Target Actual Actual Uncertainty (Solvent Safety Info. On Attac	SDS Information		Pedro L. Rentas	1

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*	orl-mus 70 mg/kg	2.5 mg/m3	2.0 16919-19-0	2.0	1000.0	13.8855	13.8854	14.4	0.10	99.999	1000	IN009 SID082022A1	Ammonium hexafluorosilicate (Si) IN009 sido82022A1 1000 99.999 0.10 14.4 13.8854 13.8855 1000.0
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92 II	CAS#		CAS# OSHA PEL (TWA) LD50 SRM  1919-19-0 2.5 mg/m3 orl-mus 70 mg/kg NA	1. Ammonium hexafluorosilicate (Si) IN009 siposzozza1 1000 98.899 0.10 14.4 13.8854 13.8855 1000.0 2.0 169	Compound  RM# Number Conc. (µg/mL) (%) Purity (%) (%) Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL)
		Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)  1000.0 2.0 16919-19-0 2.5 mg/m3	Conc. (µg/mL) +/- (µg/mL) CAS# OSHA PEL (TWA)  1000.0 2.0 18919-19-0 2.5 mg/m3	10 14.4 13.8	(%) (%) Weigh
Conc. (µg/mL) +/- (µg/mL) 1000.0 2.0 10	Conc. (µg/mL) +/- (µg/mL) CAS#  1000.0 2.0 16919-19-0			3854 13.8855	ht (g) Weight (g)
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Part # 57014

1 of 2



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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

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(I) = larget analyte

#### Physical Characterization:

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

Certified by:

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

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<sup>\*</sup> All standard containers are meticulously cleaned prior to use.
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Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.

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

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

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### Certified Reference Material CRM

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).



Certified Reference Material CRM

Lot #

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

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

							Ггасе Ме	tals	Verifica	tion	by ICP-I	SN (	μg/mL)						
≥	<0.02	ß	<0.02	Dy	<0.02	HH.	<0.02	L	<0.02	Z.	T	P	<0.02	Se	<0.2	4L	<0.02	₩	40,02
Sb	<0.02	Ç	<0.2	펅	<0.02	Ж	<0.02	Ē	<0.02	\$	<0.02	Re	<0.02	S:	<0.02	T <sub>e</sub>	<0.02	Ϥ	40.02
As	402	င္ပ	<0.02	Eu	<0.02	Б	<0.02	Mg	<0.01	ွှ	<0.02	Rh	<0.02	Ag	<0.02	∄	<0.02	<	40,02
Ba	<0.02	ß	<0.02	වු	<0.02	F.	<0.02	Mn	<0.02	Pd	<0.02	RЪ	<0.02	Z <sub>a</sub>	40.2	Ħ	<0.02	7	40.02
Ве	<0.01	ਨ	<0.02	Ga	<0.02	Fe	<0.2	Hg	40.2	Ā	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	¥	40.02
Bi	<0.02	င္ပ	<0.02	ଦ୍ଧ	<0.02	La	<0.02	Мо	<0.02	¥	<0.02	Sm	40.02	S	<0.02	Sn	<0.02	Zn	40.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	M	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	7	<0.02	Zr	<0.02
									(T) - Towart analysis		that								

= larget analyte

#### Physical Characterization:

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

Certified by:

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

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

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

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

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

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

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### Certified Reference Material CRM

M5962 R! 06/14/24



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

m/z->		io io	m/z->	-	Ņ	m/z->	i i	1. Selenium (Se)	Compound		<		Nominal Co	Re			CERTIFIED WEIGHT HEPOHT	מדודודה שובום
210	1.OE8	2.008	110	1.OE8		10	[1] Spectrum No.1				Volume shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Recommended Storage:	1	Lot Number: Description:	Part Number:	1 11000H
0			0			Ü	Z 2 0	58134	Number	Part	as dilute					in in in	_	
220			120			20	-	071223	Number	Lot	d to (mL):	6UTB	1000	Ambient (20 °C)		060624 Selenium (Se)	57034	
Ŋ			<u></u>			ω	3.702	0.1000	Factor	Dilution	2000.07			<u>ග</u>		Se)		
230			130			30	sec]:58	200.0	Vol. (mL	Initial	0.100	5E-05						
240			140			40	33.702 sec]:58034.D# [Count] [Linear]	0.084	Val. (mL) Pipette (mL) Conc. (μg/mL)	Uncertainty	Flask Uncertainty	Balance Uncertainty						
250			150			50	Count) [L	1000	Conc. (µg/mL)	Nominal	ťγ	ainty			2.0%	24007540	24002546	
260			160			. 60	inear	10002.5	Conc. (µg/mL	Initial				(m_C)	40.0	Na Contraction	Solvent:	
0						12 33 34		1000.0	Conc. (µg/mL) Conc. (µg/mL)	Final					Nitric Acid			(1)
			170			70		2.2	.) +/- (µg/mL)	Uncertainty	Expanded	Reviewed By:	ta	N	Formulated By:	M		10
			180			80		7782-49-2	C	(So		y:	de	11	By:			
			190			90		2 0.2 mg/m3	OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)	SDS Information	Pedro L. Rentas	leenes		Benson Chan	M		
			2200			100			VA)	). On Atta	rmation	ntas	,	/	ב	5		
						-		orl-rat 6700 mg/kg	1.050	ched pg.)		060624			060624			
								3149	SRM	NIST		ٿ			1+2			

							I race M	1etals	Verifica	lion	oy ICP-M	S (H	g/mL)						
Al	<0.02	CG	<0.02	Dγ	<0.02	HH	<0.02	11	<0.02	Z.	<0.02	Pr	<0.02	Se	H	16	40.02	W	40,02
SЪ	<0.02	ದ್ದ	<0.2	퍜	<0.02	풘	<0.02	Į	<0.02	₽	<0.02	Re	<0.02	S:	<0.02	Te	<0.02	U	<0.02
As	<0.2	ಕಿ	<0.02	핃	<0.02	Ы	<0.02	Mg	<0.01	°	<0.02	Rh	40.02	Ag	<0.02	∄	40.02	۷	<0.02
Ва	<0.02	င္တ	<0.02	æ	<0.02	H.	<0.02	Mn	<0.02	Pd	40.02	₽.	<0.02	Na	<0.2	Ħ	<0.02	4	<0.02
Ве	40.01	ť	40.02	Ga	<0.02	Fe	<0.2	Hg	A02	P	<0.02	Ru	40.02	Sr	<0.02	Tm	<0.02	¥	<0.02
Bi	40.02	င္ပ	<0.02	ଦୁ	<0.02	Ľ	<0.02	Mo	<0.02	7	<0.02	Sm	40.02	S	<0.02	Sn	40.02	Zn	<0.02
В	<0.02	Cι	<0.02	Au	<0.02	Pb	<0.02	M	<0.02	×	40.2	Sc	<0.02	Ta	<0.02	Ħ	<0.02	Zr	<0.02

(T) = Target analyte

#### Physical Characterization:

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

Certified by:

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

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

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

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

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

CERTIFIED WEIGHT REPORT:
Part Number:
Lot Number: Lithium nitrate (Li) Nominal Concentration (µg/mL): m/z-> Recommended Storage: Volume shown below was diluted to (mL): NIST Test Number: **Expiration Date** [1] Spectrum No.1 [ 32.093 sec]:58003.D# [Count] [Linear] Description: 210 10 Part Lot Number Number 58103 070622 0.1000 57003 062124 Lithium (Li) 6UTB 062127 Ambient (20 °C) 1000 220 120 20 250.11 230 25.0 0.004 Initial Uncertainty Nominal Initial Final

Vol. (mL) Pipette (ml.) Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL) 0.016 Flask Uncertainty 5E-05 Balance Uncertainty HEBSON OF PSON 240 40 1000 24002546 Lot# 2.0% 250 150 50 Nitric Acid Solvent: 10000.4 (mL) 260 1000.0 Nitric Acid 7/01/24 Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Giovannie Capacito 2.0 7790-69-4 5 mg/m3 orl-rat 1426 mg/kg NA SDS Information
(Solvent Safety Info. On Attached pg.)
CAS# OSHA PEL (TWA) LD50 Pedro L. Rentas Giovanni Esposito 9 0 062124 062124 SRM

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**\$** 

Certified Reference Material CRM

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Part # 57003 Lot # 062124

1 of 2

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## Certified Reference Material CRM



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

40.02 40.01	40.2 40.02	40.02	40.2		<0.02	40.02				
8 ជ ជ	ರ ಜ	cs		င့	C	6	2	l		
20.02	3	<0.02	<0.02	<0.02	<0.2	20.02	9			
	င့	Ga	6	Eu	략	Ly		l		
3	<0.02	<0.02	<0.02	<0.02	<0.02	20.02	A0 003	١		
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<0.2	<0.02	<0.02	<0.02	20.02	20.02	3	<0.02		y ICP-M	۱
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<0.02	<0.02	<0.02	<0.02	0.02	0.00	9	<0.02			١
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<0.0Z	20.02	40.02	20.2	0.02	0.02	A 03	<0.2			I
E	1 1	B	1	1 :	3 :	<del>-</del>	Тъ			I
20.02	\$0.0Z	40.02	6.05	0.02	200	<0.02	<0.02			
E	2 1	7 -	< ?	∳ .	<	d	W			
20,02	20.02	40.02	20.00	3 8	20.02	<0.02	<0.02			

(T) = Target analyte

### Physical Characterization:

Al Sh As Ba Ba Bi

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

Certified by:

	Puri	굺
	Purified acids, 18.2 megohm deionized water, calibrated Class A glassware and the highest purity raw materials are used in	certifi
	ids,	ed v
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	ca	ate
	ğ	<u>d</u>
	ate	rom
	G	gra
	sse	MINE
	Þ	- EE
	gla	2
	WSS	ano
	are	V
	an	ŭ
	d	ec
	ne	5
	ngr	1100
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	8	d
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the preparation of all standards.

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

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

\* Standards are prepared gravimetrically using balances that are calibrated.

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

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

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

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

Part # 57003 Lot # 062124

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info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 **PRODUCT DESCRIPTION**

**Product Code:** 

Single Analyte Custom Grade Solution

Catalog Number:

CGMO1

Lot Number:

T2-MO720876

Matrix:

**H2O** 

tr. NH40H

Value / Analyte(s):

1 000 µg/mL ea:

Molybdenum

Starting Material:

Ammonium Molybdate

Starting Material Lot#:

2361

Starting Material Purity: 99.9893%

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

**Certified Value:** 

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

Density:

1.000 g/mL (measured at 20 ± 4 °C)

### Assav Information:

Assay Method #1

998 ± 4 µg/mL

ICP Assay NIST SRM 3134 Lot Number: 130418

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

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

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

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

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

Xi = mean of Assay Method : with standard uncertainty uchar i

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

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

### Characterization of CRM/RM by One Method

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

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

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

ucher a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94 +6 6,7,8,9 [MoO4]-2(chemical form as received)

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

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

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

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

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

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

### 11.1 Certification Issue Date

July 17, 2022

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

### 11.2 Lot Expiration Date

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

### 11.3 Period of Validity

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

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

Uyen Truong Supervisor, Product Documentation

Meyer Trusing

### **Certificate Approved By:**

Michael Booth Director, Technical Michael 2 Booth

### **Certifying Officer:**

Paul Gaines Chairman / Senior Technical Director Paul R Saine

### Certificate of Analysis 6652M , 8782M

MORGANIC NE NE SE SEGENE YOU TREST

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

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com



### ACCREDITATION / REGISTRATION

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

### PRODUCT DESCRIPTION

Catalog Number:

Single Analyte Custom Grade Solution Product Code:

CGTN

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

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

Starting Material Lot#: 2094 Starting Material: Ti Metal

Starting Material Purity: 99.9975%

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

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

Assay Information:

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

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

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

XCRANGAM =  $(x_a)$  (ucher a) X =  $x_a$  mass of Keesy Method A with  $x_a$  =  $x_a$  the standard uncertainty of

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

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

4.0 TRACEABILITY TO NIST

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

### 4.2 Balance Calibration

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

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

CRM/RMs are tested for trace metallic impurities by Axial ICP-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 III bA-Bitter of ore each element, is reported below, solutions tested by ICP-MS were analyzed in an III bA-Bitter of the properties of the properties

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

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

Page 2 of 4

INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

> uR M 882000.0

> 9A M 886 0.000.0

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

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

> iN O 882000.0 > sO M 841200.0

> dN O 322500.0 > N M 862000.0

M - Checked by ICP-MS

Mn < Mg < Li <

> 0H

> 6H

ΉŁ

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

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

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

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

> 6T M 882000.0 > AT M 882000.0

sT M 034450.0 > dT M E70100.0

s 852000.0 M 882000.0

O.000269 O

O.043560 O

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

> II

JS

674000.0 228610.0

892000.0 892000.0

0.000268

699630.0

0.001341

892000.0

0.010560

960000'0

960000.0

73260.0 > nZ O 402100.0 038540.0 > nZ O 267400.0

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

7.7 Storage and Handling Recommendations

oM M 882000.0

0.000268 M K 0.000268 M K 0.000268 M K

0.000872 O Fe > 0.008586 M Ga <

O 892000.0

O S37000.0 M 882000.0

M 882000.0

M 603100.0

M 885800.0

M £83200.0 > 00 M GG8020 0.004577 M Gd <

INTENDED USE

W Et < O Cn <

O B <

IA O

### 4.1 Thermometer Calibration

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

### Page 3 of 4

- Chemical Testing - Accredited / AZLA Certificate Number 863.01

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

- QSR Certificate Number QSR-1034

1.01 ISO 9001 Qualify Management System Registration

### MOITATY STANDARD DOCUMENTATION 0.01

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

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

### HOMOGENEITY

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

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

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

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

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

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

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

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

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

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

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

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

Page 4 of 4

Chairman / Senior Technical Director

- Sealed TCT Bag Open Date:

NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

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

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

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

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

Thomas Kozikowski Manager, Quality Control Certificate Approved By:

thibils Validity

- June 17, 2027 11.2 Lot Expiration Date

June 17, 2022 11.1 Certification Issue Date

Paul Gaines Certifying Officer:

0.Sr

0.11

CERTIFIED WEIGHT REPORT:

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



# Certified Reference Mater



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

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

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





Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

						Ī	Trace Me	etals	Verifica	tion	by ICP-I	ξS	(na/mr)						
Name of	THE RESIDENCE OF THE PERSON NAMED IN	MARKET STATES	WITH STATE OF	Section 1	Control of the last	SCHOOL STATE	The Section	THE REAL PROPERTY.	Service Control of the Party of		Management of the last of the	Service of the last	в	William .	The state of the s	<b>MANAGEMENT</b>	SHARWARD CONTRACTOR		The second second second
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																		1	

(T) = Target analyte

## Physical Characterization:

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



Certified by:

1. P

Lot # 031524

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

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

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

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

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



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

### M5984 R:6/14/24

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 Custom Grade Solution

Catalog Number:

CGY10

Lot Number:

V2-Y740548

Matrix:

2% (v/v) HNO3

Value / Analyte(s):

10 000 μg/mL ea:

Yttrium

Starting Material:

Yttrium Oxide

Starting Material Lot#:

2661 and 06230520YL

Starting Material Purity:

99.9984%

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**Certified Value:** 

10000 ± 30 µg/mL

Density:

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

### **Assay Information:**

Assay Method #1

10011 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #2

9997 ± 50 µg/mL

ICP Assay NIST SRM 3167a Lot Number: 190730

Assay Method #3

9984 ± 31 µg/mL

Calculated NIST SRM Lot Number: See Sec. 4.2

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

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

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

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

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

X<sub>i</sub> = mean of Assay Method i with standard uncertainty uchar i

w<sub>i</sub> = the weighting factors for each method calculated using the inverse square of

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

uits = 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.

Characterization of CRM/RM by One Method

is used is the mean of individual results:

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

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

ults = long term stability standard uncertainty (storage)

XCRM/RM = (Xa) (uchar a)

k = coverage factor = 2

uchar a = the errors from characterization

uts = transport stability standard uncertainty

Certified Value, X<sub>CRM/RM</sub>, where one method of characterization

ucher a = the standard uncertainty of characterization Method A

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

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.

M	Ag	<	0.004600	М	Eu		0.009037	M	Na		0.086360	M	Se	<	0.005200	М	Zn		0.030125
M	A!		0.014862	0	Fe		0.002410	М	Nb	<	0.000570	0	Si		0.024100	0	Zr	<	0.002600
M	As	<	0.003500	M	Ga	<	0.000570	М	Nd		0.000923	M	Sm		0.000461				
M	Au	<	0.001700	M	Gd	<	0.003500	М	Ni	<	0.005700	M	Sn	<	0.002300				
0	В		0.002209	M	Ge	<	0.005200	М	Os	<	0.001200	M	Sr	<	0.004600				
0	Ba	<	0.002500	М	Hf	<	0.000570	n	Р	<		M	Ta	<	0.000570				
0	Ве	<	0.001400	M	Hg	<	0.000570	M	Pb		0.005020	M	Τb		0.001044				
М	Bi	<	0.003500	M	Но		0.009037	M	Pd	<	0.005100	М	Te	<	0.002300				
0	Ca		0.009841	M	In	<	0.002300	M	Pr	<	0.002300	М	Th	<	0.000570				
M	Cd	<	0.000570	М	Ir	<	0.000570	М	Pt	<	0.000570	М	Ti	<	0.003500				
М	Ce	<	0.002300	0	K		0.018677	М	Rb	<	0.000570	М	TI	<	0.000570				
М	Co	<	0.000570	М	La		0.000461	М	Re	<	0.000570	М	Tm	<	0.003500				
М	Cr	<	0.004000	0	Li	<	0.009300	M	Rh	<	0.008000	М	U	<	0.000570				
M	Cs	<	0.000570	М	Lu		0.000582	M	Ru	<	0.000570	М	٧		0.001265				
М	Cu		0.002610	0	Mg		0.001486	n	S	<		М	W	<	0.002300				
М	Dy		0.003815	М	Mn		0.000582	М	Sb		0.005422	s	Υ	<					
М	Er		0.003615	М	Мо	<	0.005700	М	Sc	<	0.001200	М	Yb		0.001827				

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**

6.1 This standard is intended for the calibration of analytical instruments and validation of analytical methods as appropriate. This CRM may be used in connection with EPA Methods 6010, 6020 (all versions), Standard Methods 3120 B and USP <232> / ICH Q3D.

6.2 For products attaining traceability through Inorganic Ventures' Primary Certified Reference Materials (PCRM™) see the Limited License to Use PCRM™ in the Inorganic Ventures Terms and Conditions of Sale.

https://www.inorganicventures.com/terms-and-conditions-sale. The Terms and Conditions contain information on the use of materials traceable to PCRM™ certified reference materials. This Limited License agreement is especially pertinent for laboratories accredited under ISO:17034.

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

### 7.1 Storage and Handling Recommendations

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.91 +3 6 Y(OH)(H2O)x+2 Chemical Compatibility -Soluble in HCl, H2SO4 and HNO3. Avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions

chemically stable for years in 2-5% HNO3 / LDPE container.

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in

H2O/ HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCl or HNO3).

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 89 amu	0.8 ppt	N/A	73Ge16O, 178Hf+2
ICP-OES 360.073 nm	0.005 / 0.000036 µg/mL	1	Ce, Th
ICP-OES 371.030 nm	0.004 / 0.00007 µg/mL	1	Ce
ICP-OES 377.433 nm	0.005 / 0.0009 μg/mL	1	Ta, Th

### 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: 540.565.3012; inorganicventures.com;

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

### 11.1 Certification Issue Date

February 20, 2024

- 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 20, 2029
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

### 12.0 **NAMES AND SIGNATURES OF CERTIFYING OFFICERS**

Certificate Prepared By:

Uyen Truong **Custom Processing Supervisor**  Mayor May

### **Certificate Approved By:**

Muzzammii Khan Stock Laboratory Supervisor

**Certifying Officer:** 

Paul Gaines Chairman / Senior Technical Director



### Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com R: 2/22/2024 M5999 P: 800-669-6799/540-585-3030 F: 540-585-3012 info@inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

**Product Code:** 

Multi Analyte Custom Grade Solution

Catalog Number:

CLPP-SPK-1

Lot Number:

T2-MEB721963

Matrix:

7% (v/v) HNO3

Value / Analyte(s):

2 000 µg/mL ea:

Aluminum,

Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Manganese,

Nickel, Zinc,

Vanadium,

Cobalt,

250 µg/mL ea:

Copper,

200 µg/mL ea: Chromium,

50 µg/mL ea:

Beryllium,

ium, Silver

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

**ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE** 2 000 ± 7 µg/mL 2 000 ± 9 µg/mL Aluminum, Al Barium, Ba Beryllium, Be 50.00 ± 0.26 µg/mL Chromium, Cr 200.0 ± 1.1 µg/mL 500.0 ± 2.4 µg/mL Cobalt, Co Copper, Cu 250.0 ± 1.0 µg/mL Iron, Fe 1 000 ± 4 µg/mL 500.0 ± 2.0 µg/mL Manganese, Mn Nickel, Ni 500.0 ± 2.2 µg/mL Silver, Ag 50.00 ± 0.22 µg/mL 500.0 ± 2.2 μg/mL 500.0 ± 2.2 µg/mL Vanadium, V Zinc, Zn

Density:

1.070 g/mL (measured at 20 ± 4 °C)

**Assay Information:** 

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

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

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

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

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

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

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

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

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

k = coverage factor = 2

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

ubb = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

### Characterization of CRM/RM by One Method

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

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

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

u<sub>char a</sub> = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

uchar a = the errors from characterization

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.689.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

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

### 11.1 Certification Issue Date

July 27, 2022

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

### 11.2 Lot Expiration Date

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### **Certificate Approved By:**

Thomas Kozikowski Manager, Quality Control

**Certifying Officer:** 

**Paul Gaines** 

Paul R Line Chairman / Senior Technical Director

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



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

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

m/z->	1.006	2.016	m/z->	N O	5.0E6	m/z->	1.1.1.	2.5E5	6-6	5.0E5	Aluminum nitrate nonahydrate (Al)	Compound	Weight shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Recommended Storage:	Fyniret	Des	Fan Lot	CERTIFIED WEIGHT REPORT:
210			110			10				[1] Spectrum No.1	11	RM#	below was dilut	Number:	(µg/mL):	Storage:	Evniration Data:	Description:	Fart Number:	
220			120			20				_	IN022 ALM112021A1	Lot Number Co		6UTB	10000	Ambient (20 °C)	011636	Aluminum (Al)	011623	)
230			130			30				5.014 sec]:	10000 99.999	Nominal Purity Conc. (µg/mL) (%)	2000.02 0.05	5E-0		<u>.</u>				
240			140			40				15.014 sec]:58113.D# [Count] [Linear]	9 0.10 7.30	Purity Uncertainty Assay (%) Purity (%) (%)	0.058 Flask Uncertainty	5E-05 Balance Uncertainty			2%		Solvent:	<b>&gt;</b>
250			150			50				Count] [Line	0 273.9779	ay Target ) Weight (g)		<b>y</b>		(1117)			it: 20510011	
260			160			60				»ar]	274.0078 1	Actual Weight (g) Con					Nitric Acid		Nitric Acid	
			170			70					10001.1 2	Actual Unce Conc. (µg/mL) +/- (		Revi			Form	7	~e	7
			180			80					20.0 7784-27-2	Expanded (Si Uncertainty (Si +/- (µg/mL) CAS#		Reviewed By:	tach		Formulated By:	200 A contract	L'internation of	
			190			90					2 mg/m3	SUS Information blvent Safety Info. On Attac OSHA PEL (TWA)		Pedro L. Rentas	pena		Giovanni Esposito	(	7	
			200			100						Attached		38	8		sito		e de	
											orl-rat 3671 mg/kg 3101a	pg.) NIST LD50 SRM		011623			011623			

Nitric Acid 69%

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





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

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

Revision No.: 0

Test	Specification	Result
Assay (HNO <sub>3</sub> )	69.0 - 70.0 %	69.7 %
Appearance	Passes Test	Passes Test
Color (APHA)	≤ 10	5
Residue after Ignition	≤ 2 ppm	1 ppm
Chloride (Cl)	≤ 0.08 ppm	< 0.03 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities ~ Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	2.3 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	100 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities – Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities – Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb

>>> Continued on page 2 >>>





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

n Result	Result
< 1.0 ppb	< 1.0 ppb
16 ppb	16 ppb
< 10 ppb	< 10 ppb
< 1.0 ppb	< 1.0 ppb
< 5.0 ppb	< 5.0 ppb
< 1.0 ppb	< 1.0 ppb
< 5.0 ppb	< 5.0 ppb
< 5.0 ppb	< 5.0 ppb
< 10.0 ppb	< 10.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
< 1.0 ppb	< 1.0 ppb
10 par/ml	
3 par/ml	3 par/ml

Nitric Acid 69% CMOS





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

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Jamie Croak
Director Quality Operations, Bioscience Production

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





paper m6039 Certificate of Analysis m6040

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

Revision No.: 0

Test	Specification	Result
ACS – Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.192
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS - Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS Free Chlorine (as Cl2)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO <sub>4</sub> )	≤ 0.05 ppm	0.03 ppm
Sulfate (SO <sub>4</sub> )	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO <sub>3</sub> )	≤ 0.8 ppm	0.3 ppm
Ammonium (NH <sub>4</sub> )	≤ 3 ppm	< 1 ppm
Trace Impurities - Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (AI)	≤ 10.0 ppb	< 5.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 10.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 20.0 ppb	2.2 ppb
Trace Impurities - Cadmium (Cd)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	31.0 ppb
Trace Impurities - Chromium (Cr)	≤ 1.0 ppb	0.5 ppb
Trace Impurities - Cobalt (Co)	≤ 1.0 ppb	0.2 ppb
Trace Impurities - Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities - Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities - Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities - Gold (Au)	≤ 4.0 ppb	< 0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 15 ppb	3 ppb

>>> Continued on page 2 >>>





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

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

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





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

Test Specification Result

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

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC









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

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

Revision No.: 0

Test	Specification	Result	_
Assay (HNO <sub>3</sub> )	69.0 - 70.0 %	69.7 %	
Appearance	Passes Test	Passes Test	
Color (APHA)	≤ 10	5	
Residue after Ignition	≤ 2 ppm	1 ppm	
Chloride (CI)	≤ 0.08 ppm	< 0.03 ppm	
Phosphate (PO <sub>4</sub> )	≤ 0.10 ppm	< 0.03 ppm	
Sulfate (SO <sub>4</sub> )	≤ 0.2 ppm	< 0.2 ppm	
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb	
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb	
Trace Impurities – Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb	
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb	
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb	
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	2.3 ppb	
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	< 1.0 ppb	
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities – Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb	
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb	
Heavy Metals (as Pb)	≤ 100 ppb	100 ppb	
Trace Impurities – Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb	
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb	
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb	
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb	





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

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

Nitric Acid 69% CMOS





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

Test Specification Result

For Microelectronic Use

Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC

Jamie Croak
Director Quality Operations, Bioscience Production

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

www.absolutestandards.com



## Certified Reference Material CRM

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

CERTIFIED WEIGHT REPORT:

Part Number:

58111 122223

Sodium (Na)

Lot Number: Description:

Nominal Concentration (µg/mL):

**NIST Test Number:** 

**6UTB** 10000

Weight shown below was diluted to (mL):

3000.4

0.06 Flask Uncertainty 5E-05 Balance Uncertainty

RW#

Number Lot

Nominal

Purity

Uncertainty Assay Purity (%)

Target

Actual

8

38

Recommended Storage:

Ambient (20 °C)

122226

**Expiration Date:** 

Lot # M5807

Solvent:

24002546 Nitric Acid

2%

60.0 (III)

Nitric Acid

Formulated By: 13827 P Aleah O'Brady Back

Reviewed By: Pedro L. Rentas

122223

22223

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

CAS#

SE

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

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



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

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

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## Physical Characterization:

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

Certified by:

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

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

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## Certified Reference Material CRM

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

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

1. Antimony (Sb)

58151

100923

0.1000

300.0

1000

10001.4

1000.0

7440-36-0

0.5 mg/m3

orl-rat 7000 mg/kg 3102a

Number Part

Number Ď

Vol. (ml.)

Pipette (ml.) Conc. (µg/ml.)

Conc. (µg/mL)

Conc. (µg/ml.)

+/- (µg/mt.) Uncertainty Expanded

CAS#

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

LD50

SRM NIST SDS Information

Final

Dilution Factor

Initial

Uncertainty

Nominal

Compound

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



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

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

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(1) = Target analyte

## Physical Characterization:

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

Certified by:

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

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Certified Reference Material CRM

M6030



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

R = 8 | 5 | 24

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

800-368-1131

Absolute Standards, Inc.

Part Number: Solvent: 24002546 Lot # Nitric Acid

Lot Number: Description: 57047 122823 Silver (Ag)

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

Weight shown below was diluted to (mL): 4000.30

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

2% <u>E</u> 80.0 Nitric Acid Reviewed By: Formulated By:

[1] Spectrum No.1

IN035 J0612AGA1

1000.0

0.10

63.7

6.27992

6.27998

1000.0

2.0

7761-88-B

10 ug/m3

Z

3151

RM#

Number

Conc. (µg/mL)

8

Purity (%)

38

Weight (g)

Weight (g) Conc. (µg/mL)

+/- (µg/mL) Uncertainty

CAS#

(Solvent Safety Info. On Attached pg.)

NIST SRM

SDS Information

Pedro L. Rentas

122823

Benson Chan

122823

Target

Actual

Actual

Expanded

헏

Nominal

Purity Uncertainty Assay

1. Silver nitrate (Ag)

Compound

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

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							race Me	letals	Verificat	tion	by ICP-I	S	ug/mL)						
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Physical Characterization:

(T)= Target analyte

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

Certified by:

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

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

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## Certified Reference Material CRM

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

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

CERTIFIED WEIGHT REPORT:

Part Number:

56138 082922

Solvent: 20510011

Nitric Acid

2% 20.0 Nitric Acid

Formulated By:

Lawrence Barry

082922

<u>P</u>

Ambient (20 °C) 082925

10000

Nominal Concentration (µg/mL):

Recommended Storage:

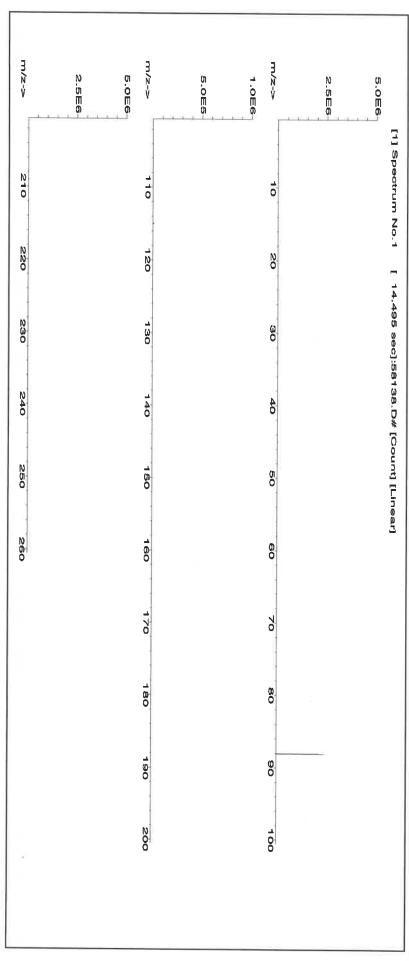
**Expiration Date:** 

Description: Lot Number:

Strontium (Sr)

Weight shown below was diluted to (mL): NIST Test Number: 6UTB 1000.12 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Expanded Pedro L. Rentas 082922

Strontium nitrate (Sr IN017 SRZ022018A1 RM# Number 닭 Conc. (µg/mL) 10000 Nominal 99.997 Purity Uncertainty Assay 8 Purity (%) 0.10 41.2 8 24.2756 Weight (g) Weight (g) Conc. (µg/mL) +/- (µg/mL) 24.2758 10000.1 Uncertainty 20.0 10042-76-9 CAS# SDS Information
(Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) Ι₹ orl-rat >2000mg/kg 3153a LD50 SRM SRM



www.absolutestandards.com



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

П				П		Ш	Trace Me	tals	Verifica	tion	by ICP-	S	μg/mL)	П					
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В	<0.02	C <sub>L</sub>	<0.02	Au	<0.02	Рь	<0.02	Nd	40.02	×	<0.2	Sc	<0.02	Ta	<0.02	1	<0.02	Zr	<0.02

Physical Characterization:

(T)= Target analyte

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

Certified by:

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## Certified Reference Material CRM

M6023

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

CERTIFIED WEIGHT REPORT: Part Number:

57081 062724 Solvent: 24002546 Nitric Acid

**Lot Number:** Description: Thaillum (TI)

2%

Nitric Acid

Formulated By:

Aleah O'Brady

062724

ARREN DIBERTY

<u>a</u> 40.0

Nominal Concentration (µg/mL): Recommended Storage: **Expiration Date:** 062727 1000 Ambient (20 °C)

**NIST Test Number: BTU9** 

Weight shown below was diluted to (mL): 2000.1

Thallium nitrate (TI)

IN037 BCCF4399

1000

888.88

0.10

77.0

2.5975

2.5977

1000.1

2.0

10102-45-1

0.1 mg/m3

orl-mus 15mg/kg 3158

Compound

₽ #

Number Į,

Conc. (µg/mL)

8

Purity (%)

(%)

Weight (g)

Nominal

0.10 Flask Uncertainty 5E-05 Balance Uncertainty

Purity Uncertainty Assay Target

Actual Actual

Uncertain

Weight (g) Conc. (µg/mL) +/- (µg/

Expanded

Reviewed By:

Pedro L. Rentas

062724

SRM	LD50	OSHA PEL (TWA)	/mL) CAS#	(Jm/
TSIN	tached pg.)	(Solvent Safety Info. On Attached pg.)	(Solven	inty
	2	SDS Information		ed.

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		180				80		
		190				90		
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https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number

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

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## Physical Characterization:

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

Certified by:

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# Certified Reference Material CRM

M6021

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

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

2.0% (III) 40.0 Nitric Acid Formulated By: ASSOCIATION OF THE PROPERTY

Aleah O'Brady

062424

062424

Description: Lot Number:

Vanadium (V)

Recommended Storage: **Expiration Date:** 1000 Ambient (20 °C) 062427

Nominal Concentration (µg/mL): Volume shown below was diluted to (mL): **NIST Test Number: 6UTB** 2000.3 5E-05 0.06 Flask Uncertainty Balance Uncertainty Reviewed By: Expanded Pedro L. Rentas SDS Information

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

m/z-> -K-Z/UJ 17/2-V 2.588 5.0E8 2.0日7 1.0E7 1.0回6 2.0E6 [1] Spectrum No.1 110 210 10 120 220 NO [ 34.243 sec]:58029:D# [Count] [Linear] 130 1230 90 140 240 0 150 250 50 160 260 60 170 70 80 180 190 90 100 200



### 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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yte	A0.2	40.02	40.02	20.02	3	∆ 0,02	40.02	20.02		l	by ICP-N	
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	Z	Zn	×	Ϋ́B		<	a	¥	<b>WEATHERSON</b>			
	<0.02	<b>∆</b> 0.02	40.02	<0.02	-	-}	A).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).
- \* 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).