

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

Order ID: N3259

Test: Metals Group3

Prepbatch ID: PB145317,

**Sequence ID/Qc Batch ID:** LB120624,LB120624,LB120624,LB120678,LB120678,LB120678,LB120705,LB120705,LB120705,

Sta	nd	ar	A	ın	ı
อเล	ma	ar	"	,	

MP67303, MP67322, MP69236, MP69533, MP69788, MP69947, MP69948, MP69949, MP69950, MP69951, MP69952, MP69954, MP69955, MP69956, MP69957, MP69958, MP69959, MP69968, MP70022, MP69959, M

#### Chemical ID:

 $M4390,M4516,M4543,M4551,M4589,M4590,M4599,M4628,M4629,M4631,M4644,M4656,M4657,M4705,M4707,M4718,\\M4768,M4810,M4825,M4844,M4874,M4876,M4877,M4879,M4880,M4881,M4882,M4883,M4884,M4885,M4886,M4887,\\M4889,M4891,M4901,M4902,M4939,M4960,M4961,M5019,M5020,M5023,M5027,M5066,M5074,M5079,M5100,M5109,\\M5110,M5126,M5150,M5154,M5168,M5171,M5186,M69953,W2606,$ 

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

## **Metals STANDARD PREPARATION LOG**

Recipe <u>ID</u> 902	NAME ICP AES CAL BLK ( SO/ICB/CCB)	NO. MP67303	Prep Date 12/30/2021	Expiration Date 12/30/2022	Prepared By Bin He	ScaleID None	PipetteID  METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/03/2022
FROM	125.00000ml of M5027 + 2350.0000	Oml of W260	06 + 25.00000	oml of M5023 =	Final Quantity:	2500.000 ml	<u>                                       </u>	

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
170	1:1HCL	MP67322	01/03/2022	06/28/2022	Rakeshkumar Patel	None	None	01/04/2022

**FROM** 1250.00000ml of M5027 + 1250.00000ml of W2606 = Final Quantity: 2500.000 ml

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

#### Metals STANDARD PREPARATION LOG

Recipe				Expiration	Prepared			Supervised By
<u>ID</u> 2950	NAME ICP AES S1/CRI STOCK STD	NO. MP69236	Prep Date 04/29/2022	<u>Date</u> 06/30/2022	<u><b>By</b></u> Bin He	<u>ScaleID</u> None	PipetteID  METALS PIP	Sarabjit Jaswal
2930	TOP ALS STICKT STOCK STD	<u>IVIF 09230</u>	04/29/2022	00/30/2022	DiliTie	None	ETTE_3 (A)	04/29/2022

#### **FROM**

 $0.03000ml\ of\ M4876+0.03000ml\ of\ M4877+0.05000ml\ of\ M4628+0.05000ml\ of\ M4657+0.05000ml\ of\ M4810+0.05000ml\ of\ M4885+0.06000ml\ of\ M4881+0.10000ml\ of\ M4629+0.10000ml\ of\ M4718+0.10000ml\ of\ M4874+0.10000ml\ of\ M4880+0.10000ml\ of\ M4883+0.10000ml\ of\ M4902+0.10000ml\ of\ M4939+0.15000ml\ of\ M4825+0.20000ml\ of\ M4516+0.20000ml\ of\ M4516+0.20000ml\ of\ M4707+0.20000ml\ of\ M4707+0.20000$ 

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
169	1:1HNO3	MP69533	05/13/2022	11/12/2022	Bin He	None	None	,
								05/16/2022

FROM 1250.00000ml of M5154 + 1250.00000ml of W2606 = Final Quantity: 2500.000 ml

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

## **Metals STANDARD PREPARATION LOG**

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
919	ICP AES INTERNAL STD	MP69788	05/27/2022	06/27/2022	Bin He	None	METALS_PIP ETTE_3 (A)	05/30/2022
EDOM	1 00000ml of M4961 + 10 00000ml o	f M4060 ± 1	060 00000ml	of W2606 + 20	00000ml of ME	168 = Final O	antity: 2000 00	00

FROM	1.00000ml of M4961 + 10.00000ml of M4960 + 1969.0000ml of W2606 + 20.00000ml of M5168 = Final Quantity: 2000.000
	ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	PipetteID	Supervised By
902	ICP AES CAL BLK ( SO/ICB/CCB)		06/06/2022	06/19/2022	Bin He	None	METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 06/08/2022

FROM 125.00000ml of M5150 + 2350.00000ml of W2606 + 25.00000ml of M5171 = Final Quantity: 2500.000 ml

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

## **Metals STANDARD PREPARATION LOG**

R	Recipe ID 513	NAME RINSE SOLN	NO. MP69948	Prep Date 06/06/2022	Expiration Date 06/19/2022	Prepared By Bin He	<u>ScaleID</u> None	PipetteID  METALS_PIP ETTE_3 (A)	
<u>!</u>	ROM	200.00000ml of M5171 + 9800.00000	Oml of W260	)6 = Final Qu	antity: 10000.0	00 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
912	ICP AES ICV SOLN	MP69949	06/06/2022	06/19/2022	Bin He	None	METALS_PIP ETTE_3 (A)	,

FROM 0.02500ml of M4599 + 0.02500ml of M4656 + 0.02500ml of M5019 + 0.02500ml of M5020 + 0.25000ml of M4590 + 10.00000ml of M5066 + 89.65000ml of MP69947 = Final Quantity: 100.000 ml

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

#### Metals STANDARD PREPARATION LOG

Recipe ID 904	NAME ICP AES ICSA SOLN	NO. MP69950	Prep Date 06/06/2022	Expiration Date 06/19/2022	Prepared By Bin He	<u>ScaleID</u> None	PipettelD  METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 06/08/2022
FROM	10.00000ml of M5126 + 90.00000ml	of MP69947	7 = Final Qua	ntity: 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
3494	ICP AES ICSAB SOLN-1	MP69951	06/06/2022	06/19/2022	Bin He	None	METALS_PIP ETTE_3 (A)	•

**FROM** 

0.10000ml of M4589 + 0.10000ml of M4629 + 0.10000ml of M4880 + 0.10000ml of M4882 + 0.10000ml of M4939 + 10.00000ml of M4705 + 10.00000ml of M5126 + 79.50000ml of MP69947 = Final Quantity: 100.000 ml

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

#### Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabiit Jaswal	
907	ICP AES STD S ( S5 )	MP69952	06/06/2022	06/19/2022	Bin He	None	METALS_PIP ETTE_3 (A)	,	
FROM	OM 5.00000ml of M4390 + 5.00000ml of M4589 + 5.00000ml of M4644 + 5.00000ml of M4880 + 5.00000ml of M4882 + 5.00000ml								

of M4887 + 5.00000ml of M4939 + 5.00000ml of M5100 + 460.00000ml of MP69947 = Final Quantity: 500.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By
909	<del></del>		06/06/2022	06/19/2022	Bin He		METALS PIP	Sarabjit Jaswal
							ETTE_3 (A)	06/08/2022

150.00000ml of MP69947 + 50.00000ml of MP69952 = Final Quantity: 200.000 ml **FROM** 

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

## **Metals STANDARD PREPARATION LOG**

Recipe <u>ID</u> 3913	NAME ICP AES STD S2	NO. MP69955	Prep Date 06/06/2022	Expiration Date 06/19/2022	Prepared By Bin He	<u>ScaleID</u> None	PipetteID  METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 06/08/2022
FROM	16.00000ml of MP69952 + 184.0000	Oml of MP69	9947 = Final	Quantity: 200.0	00 ml		<u> </u>	

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u> 2951	NAME ICP AES S1/CRI WORK STD	NO. MP69956	Prep Date 06/06/2022	<u>Date</u> 06/19/2022	<u><b>By</b></u> Bin He	ScaleID None	PipetteID  METALS_PIP	Sarabjit Jaswal
							ETTE_3 (A)	06/08/2022

**FROM** 196.00000ml of MP69947 + 4.00000ml of MP69236 = Final Quantity: 200.000 ml

**FROM** 

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

## **Metals STANDARD PREPARATION LOG**

	<b>Recipe ID</b> 911	NAME ICP AES CCV SOLN	NO. MP69957	Prep Date 06/06/2022	Expiration Date 06/19/2022	Prepared By Bin He	ScaleID None	PipetteID  METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 06/08/2022
ľ	FROM	100.00000ml of MP69947 + 100.000	00ml of MP6	69952 = Fina	Quantity: 200.	000 ml			

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabiit Jaswal
3651	LR CHECK 1	MP69958	06/06/2022	06/19/2022	Bin He	None	METALS_PIP ETTE_3 (A)	,

10.00000ml of M4543 + 18.00000ml of M4879 + 18.00000ml of M5109 + 18.00000ml of M5110 + 20.00000ml of M4810 + 9.00000ml of M4628 + 7.00000ml of MP69947 = Final Quantity: 100.000 ml

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

## **Metals STANDARD PREPARATION LOG**

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	NO.	Prep Date	<u>Date</u>	Ву	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
3652	LR CHECK2	MP69959	06/06/2022	06/19/2022	Bin He	None	METALS_PIP	,
							ETTE_3 (A)	06/08/2022
FROM	10.00000ml of M4551 + 2.50000ml of 5.00000ml of M4768 + 49.50000ml of					+ 4.50000ml o	f M4718 +	

902 ICP AES CAL BLK ( SO/ICB/CCB) MP69968 06/08/2022 06/14/2022 Bin He None METALS_PIP	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
	902	ICP AES CAL BLK ( SO/ICB/CCB)	MP69968	06/08/2022	06/14/2022	Bin He	None	METALS_PIP ETTE_3 (A)	

FROM 125.00000ml of M5150 + 2350.00000ml of W2606 + 25.00000ml of M5171 = Final Quantity: 2500.000 ml

284, Sheffield Street, Mountainside NJ 07092 (908) 789 - 8900

## **Metals STANDARD PREPARATION LOG**

Recipe ID 902	NAME ICP AES CAL BLK ( SO/ICB/CCB)	NO. MP70022	Prep Date 06/15/2022	Expiration Date 06/21/2022	Prepared By Bin He	ScaleID None	PipettelD  METALS_PIP ETTE_3 (A)	Supervised By
FROM	125.00000ml of M5150 + 2350.00000	oml of W260	)6 + 25.00000	oml of M5186 =	Final Quantity:	2500.000 ml		



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	P2-MEB676730	02/13/2023	09/14/2020 / BIN	07/03/2019 / bin	M4390
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57022 / Titanium (Ti) 1000PPM	111819	11/18/2022	03/18/2020 / bin	10/11/2019 / bin	M4516
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	022620	02/26/2023	09/20/2020 / jaswal	04/10/2020 / jaswal	M4543
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57056 / BARIUM 100mL 1000ug/mL	102519	10/25/2022	05/06/2021 / jaswal	02/14/2020 / jaswal	M4551
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	R2-MEB694243	06/29/2024	07/13/2020 / bin	07/02/2020 / bin	M4589
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	R2-MEB694244	06/29/2024	07/13/2020 / bin	07/02/2020 / bin	M4590



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGSR10-1 / STRONTIUM 1 X 125 ml	P2-SR681562	08/02/2023	08/24/2020 / bin	08/21/2020 / bin	M4599
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	091619	09/16/2022	08/24/2020 / bin	10/11/2019 / bin	M4628
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGSR1-1 / Strontium, 125 ml, 1000 PPM	p2-sr683295	10/10/2023	08/24/2020 / BIN	08/21/2020 / BIN	M4629
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57042 / Molybdeum, Mo, 100 ml, 1000 PPM	082019	08/20/2022	09/20/2020 / jaswal	10/11/2019 / jaswal	M4631
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	052120	05/21/2023	10/15/2020 / jaswal	10/07/2020 / jaswal	M4644
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57103 / Li, 10000 PPM, 125 ml	010320	01/03/2023	11/11/2020 / bin	10/28/2020 / bin	M4656



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	082620	08/26/2023	11/11/2020 / bin	10/28/2020 / bin	M4657
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	SA-1211+ICSB-07	12/31/2022	10/27/2021 / bin	02/20/2020 / bin	M4705
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGV1-1 / VANADIUM 125mL 1000ug/mL	P2-V685591	12/05/2023	11/21/2020 / bin	08/21/2020 / bin	M4707
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58025 / Manganese, Mn, 500 ml, 1000 PPM	070620	07/06/2023	01/14/2021 / bin	01/12/2021 / bin	M4718
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Supplier  Absolute Standards, Inc.	ItemCode / ItemName / Nickel (Ni) 1000PPM	Lot # 072420	-			
Absolute			Date	Opened By 02/26/2021 /	Received By 10/28/2020 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57027 / CO, 1000 PPM, 125 ml	020821	02/08/2024	05/23/2021 / jaswal	05/18/2021 / jaswal	M4825
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57182 / Pb, 10000 PPM, 125 ml	032321	03/23/2024	08/09/2021 / bin	05/06/2021 / jaswal	M4844
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Arsenic (As)	012521	01/25/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4874
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	030221	03/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4876
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	072821	07/28/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4877
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute	58111 / Na, 10000 PPM, 500 ml	061421	06/14/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4879



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57015 / P, 1000 PPM, 125 ml	051121	05/11/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4880
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57082 / Pb, 1000 PPM, 125 ml	062221	06/22/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4881
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	051721	05/17/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4882
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	070221	07/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4883
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	030921	03/09/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4884
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	072921	07/29/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4885



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	021121	02/11/2024	08/05/2021 / jaswal	08/05/2021 / jaswal	M4886
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	062221	06/22/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4887
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	073021	07/30/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4889
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	031921	03/19/2024	08/25/2021 / bin	08/05/2021 / jaswal	M4891
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	031921	03/19/2024	08/06/2021 / jaswal	08/06/2021 / jaswal	M4901
		-	<u>-</u>	-	-	-
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	030221	03/02/2024	09/23/2021 / bin	09/22/2021 / bin	M4939
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	100721	10/07/2024	10/09/2021 / jaswal	10/08/2021 / jaswal	M4960
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58139 / Y, 10000 PPM, 500 ml	052521	05/25/2024	10/09/2021 / jaswal	01/25/2019 / jaswal	M4961
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57116 / S, 10000 PPM, 125 ml	011421	01/14/2024	12/13/2021 / bin	12/09/2021 / bin	M5019
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57115 / P, 10000 PPM, 125 ml	032921	03/29/2024	12/13/2021 / bin	12/09/2021 / bin	M5020
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	0000266572	07/23/2025	12/28/2021 / RAKESHKUM	12/16/2021 / RAKESHKUM	M5023



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	0000281827	06/28/2022	12/29/2021 / RAKESHKUM AR	01/20/2021 / RAKESHKUM AR	M5027
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV1-1014	07/30/2022	01/31/2022 / jaswal	04/20/2021 / jaswal	M5066
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	WW-LFS-1 / Laboratory Fortified Stock Solution 1, 125 ml	P2-MEB686379	04/25/2023	04/25/2022 /	11/08/2021 / bin	M5074
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
1.						
Inorganic Ventures	WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml	R2-MEB693161	04/25/2023	04/25/2022 /	11/08/2021 / bin	M5079
T =	Fortified Stock Solution 2,	R2-MEB693161	04/25/2023  Expiration Date	Date Opened / Opened By		M5079  Chemtech Lot #
Ventures	Fortified Stock Solution 2, 125 ml		Expiration	Date Opened /	bin  Received Date /	Chemtech
Supplier Inorganic	Fortified Stock Solution 2, 125 ml  ItemCode / ItemName  CLPP-CAL-1 / CLP CAL	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech 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	022822	02/28/2025	03/30/2022 / bin	03/30/2022 / bin	M5110
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	10/25/2022	04/25/2022 / bin	04/20/2021 / bin	M5126
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)	0000275677	12/15/2025	05/23/2022 / william	04/19/2022 / JIGNESH	M5150
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22B0862001	11/12/2022	05/13/2022 / BIN	04/16/2022 / BIN	M5154
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22B0862001	11/25/2022	05/26/2022 / william	04/19/2022 / william	M5168
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22B0862001	01/27/2027	06/05/2022 / bin	04/19/2022 / william	M5171



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)	22C0462001	12/14/2022	06/15/2022 / william	06/06/2022 / william	M5186

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



#### CERTIFICATE OF ANALYSIS

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

Christiansburg, VA 24073 · USA inorganicventures.com

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

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



#### PRODUCT DESCRIPTION 2.0

Multi Analyte Custom Grade Solution Product Code:

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

5 000 μg/mL ea:

Calcium, Potassium, Magnesium, Sodium,

2 000 µg/mL ea:

Aluminum, Barium,

1 000 µg/mL ea:

Iron,

500 μg/mL ea:

Nickel, Vanadium, Zinc, Cobalt,

Manganese,

250 μg/mL ea:

Copper, Silver,

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

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

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

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

#### **Assay Information:**

3	say iiiioiiiiatioii.			
	ANALYTE	METHOD	NIST SRM#	SRM LOT#
	Ag	ICP Assay	3151	160729
	Ag	Volhard	999c	999c
	Al	ICP Assay	3101a	140903
	Al	EDTA	928	928
	Ва	ICP Assay	3104a	140909
	Ва	Gravimetric		See Sec. 4.2
	Ве	ICP Assay	3105a	090514
	Ве	Calculated		See Sec. 4.2
	Ca	ICP Assay	3109a	130213
	Ca	EDTA	928	928
	Co	EDTA	928	928
	Co	ICP Assay	traceable to 3113	M2-CO661665
	Cr	ICP Assay	3112a	170630
	Cr	Calculated		See Sec. 4.2
	Cu	ICP Assay	3114	121207
	Cu	EDTA	928	928
	Fe	ICP Assay	3126a	140812
	Fe	EDTA	928	928
	K	ICP Assay	3141a	140813
	K	Gravimetric		See Sec. 4.2
	Mg	ICP Assay	3131a	140110
	Mg	EDTA	928	928
	Mn	ICP Assay	3132	050429
	Mn	EDTA	928	928
	Na	ICP Assay	3152a	120715
	Na	Gravimetric		See Sec. 4.2
	Ni	ICP Assay	3136	120619
	Ni	EDTA	928	928
	V	ICP Assay	3165	160906
	V	EDTA	928	928
	Zn	ICP Assay	3168a	120629
	Zn	EDTA	928	928

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

#### Characterization of CRM/RM by Two or More Methods Characterization of CRM/RM by One Method Certified Value, X<sub>CRM/RM</sub>, where two or more methods of characterization are Certified Value, X<sub>CRM/RM</sub>, where one method of characterization used is the weighted mean of the results: is used is the mean of individual results: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char} a)$ X<sub>i</sub> = mean of Assay Method i with standard uncertainty u<sub>char i</sub> Xa = mean of Assay Method A with $\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of u<sub>char a</sub> = the standard uncertainty of characterization Method A $\mathbf{w_i} = (1/u_{\text{char i}})^2 / (\Sigma (1/(u_{\text{char i}})^2)$ CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$ 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

February 14, 2020

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

#### 11.2 Lot Expiration Date

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

#### 11.3 Period of Validity

- Sealed TCT Bag Open Date: _	
-------------------------------	--

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

Michael 2 Booth

#### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

Michael Booth Manager, Quality Control

#### **Certifying Officer:**

Paul Gaines

CEO, Senior Technical Director

Paul R & ine

## INORGANIC VENTURES...

M4393 OP:05/04/2020 BH R:07/03/2019

CERTIFICATE OF ANALYSIS

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

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

#### 1.0 ACCREDITATION / REGISTRATION

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



#### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CLPP-CAL-3

Lot Number: P2-MEB676730

Matrix: 7% (v/v) HNO3

Value / Analyte(s): 1 000 µg/mL ea:

Arsenic, Lead, Selenium,

Thallium, 500 µg/mL ea: Cadmium

#### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Arsenic, As  $1\ 000\pm7\ \mu\text{g/mL}$  Cadmium, Cd  $500.0\pm2.2\ \mu\text{g/mL}$  Lead, Pb  $1\ 000\pm4\ \mu\text{g/mL}$  Selenium, Se  $1\ 000\pm6\ \mu\text{g/mL}$ 

Thallium, TI 1 000  $\pm$  7  $\mu$ g/mL

**Density:** 1.045 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	993012

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 **w**<sub>i</sub> = 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 $\mathbf{u_{char}} = [\Sigma((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)]^{1/2}$ 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="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

#### 8.0 HAZARDOUS INFORMATION

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

#### 9.0 HOMOGENEITY

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

#### 10.0 QUALITY STANDARD DOCUMENTATION

#### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

#### 11.1 Certification Issue Date

February 13, 2019

- 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 13, 2023
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

#### 11.3 Period of Validity

- This 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 Supervisor, Quality Control

**Certifying Officer:** 

Paul Gaines CEO, Senior Technical Director Paul R Laines

Hydrochloric Acid, 36.5-38.0% BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis



Material No.: 9530-33 Batch No.: 0000281827

Manufactured Date: 2021/03/30

Retest Date: 2026/03/29 Revision No: 1

# Certificate of Analysis

Test	Specification	Result
ACS - Assay (as HCl) (by acid-base titrn)	36.5 - 38.0 %	37.6
ACS – Color (APHA)	<= 10	5
ACS – Residue after Ignition	<= 3 ppm	1
ACS - Specific Gravity at 60°/60°F	1.185 - 1.192	1.189
ACS – Bromide (Br)	<= 0.005 %	< 0.005
ACS - Extractable Organic Substances	<= 5 ppm	< 1
ACS - Free Chlorine (as Cl <sub>2</sub> )	<= 0.5 ppm	< 0.5
Phosphate (PO <sub>4</sub> )	<= 0.05 ppm	< 0.03
Sulfate (SO <sub>4</sub> )	<= 0.5 ppm	< 0.3
Sulfite (SO <sub>3</sub> )	<= 0.8 ppm	0.3
Ammonium (NH <sub>4</sub> )	<= 3 ppm	< 1
Trace Impurities - Arsenic (As)	<= 0.010 ppm	< 0.003
Trace Impurities - Aluminum (Al)	<= 10.0 ppb	0.5
Arsenic and Antimony (as As)	<= 5 ppb	< 3
Trace Impurities - Barium (Ba)	<= 1.0 ppb	< 0.2
Trace Impurities - Beryllium (Be)	<= 1.0 ppb	< 0.2
Trace Impurities - Bismuth (Bi)	<= 10.0 ppb	< 1.0
Trace Impurities - Boron (B)	<= 20.0 ppb	< 5.0
Trace Impurities - Cadmium (Cd)	<= 1.0 ppb	< 0.3
Trace Impurities - Calcium (Ca)	<= 50.0 ppb	15.0
Trace Impurities - Chromium (Cr)	<= 1.0 ppb	< 0.4
Trace Impurities - Cobalt (Co)	<= 1.0 ppb	< 0.3
Trace Impurities - Copper (Cu)	<= 1.0 ppb	< 0.1
Trace Impurities - Gallium (Ga)	<= 1.0 ppb	< 0.2

Material No.: 9530-33 Batch No.: 0000281827

Test	Specification	Result
Trace Impurities - Germanium (Ge)	<= 3.0 ppb	< 2.0
Trace Impurities - Gold (Au)	<= 4.0 ppb	3.0
Heavy Metals (as Pb)	<= 100 ppb	< 50
Trace Impurities – Iron (Fe)	<= 15.0 ppb	1.0
Trace Impurities - Lead (Pb)	<= 1.0 ppb	< 0.5
Trace Impurities – Lithium (Li)	<= 1.0 ppb	< 0.2
Trace Impurities - Magnesium (Mg)	<= 10.0 ppb	< 0.4
Trace Impurities - Manganese (Mn)	<= 1.0 ppb	< 0.4
Trace Impurities - Mercury (Hg)	<= 0.5 ppb	0.2
Trace Impurities - Molybdenum (Mo)	<= 10.0 ppb	< 5.0
Trace Impurities - Nickel (Ni)	<= 4.0 ppb	< 0.3
Trace Impurities - Niobium (Nb)	<= 1.0 ppb	< 0.2
Trace Impurities - Potassium (K)	<= 9.0 ppb	< 2.0
Trace Impurities - Selenium (Se), For Information Only	ppb	1.0
Trace Impurities - Silicon (Si)	<= 100.0 ppb	18.0
Trace Impurities - Silver (Ag)	<= 1.0 ppb	< 0.3
Trace Impurities - Sodium (Na)	<= 100.0 ppb	< 5.0
Trace Impurities – Strontium (Sr)	<= 1.0 ppb	< 0.2
Trace Impurities - Tantalum (Ta)	<= 1.0 ppb	< 0.9
Trace Impurities - Thallium (Tl)	<= 5.0 ppb	< 2.0
Trace Impurities - Tin (Sn)	<= 5.0 ppb	< 0.8
Trace Impurities - Titanium (Ti)	<= 1.0 ppb	< 0.2
Trace Impurities - Vanadium (V)	<= 1.0 ppb	< 0.2
Trace Impurities – Zinc (Zn)	<= 5.0 ppb	0.4
Trace Impurities – Zirconium (Zr)	<= 1.0 ppb	< 0.1

For Laboratory, Research or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications

Country of Origin: US

Packaging Site: Phillipsburg Mfg Ctr & DC



Nitric Acid, 69.0–70.0% BAKER INSTRA–ANALYZED® Reagent For Trace Metal Analysis



Material No.: 9598-34 Batch No.: 0000266572

Manufactured Date: 2020/07/24 Retest Date: 2025/07/23

Revision No: 1

# Certificate of Analysis

Test	Specification	Result
ACS - Assay (HNO <sub>3</sub> )	69.0 - 70.0 %	69.6
Appearance	Passes Test	PT
ACS – Color (APHA)	<= 10	5
ACS – Residue after Ignition	<= 2 ppm	< 1
Chloride (Cl)	<= 0.04 ppm	< 0.03
Phosphate (PO <sub>4</sub> )	<= 0.1 ppm	< 0.01
Sulfate (SO <sub>4</sub> )	<= 0.4 ppm	< 0.2
Trace Impurities - Aluminum (Al)	<= 30.0 ppb	< 0.2
Arsenic and Antimony (as As)	<= 5 ppb	< 2
Trace Impurities – Barium (Ba)	<= 1.0 ppb	< 0.2
Trace Impurities - Beryllium (Be)	<= 1.0 ppb	< 0.2
Trace Impurities - Bismuth (Bi)	<= 1.0 ppb	< 1.0
Trace Impurities – Boron (B)	<= 4.0 ppb	< 0.7
Trace Impurities - Cadmium (Cd)	<= 1.0 ppb	< 0.3
Trace Impurities - Calcium (Ca)	<= 50.0 ppb	< 1.0
Trace Impurities - Chromium (Cr)	<= 10.0 ppb	3.0
Trace Impurities - Cobalt (Co)	<= 1.0 ppb	< 0.3
Trace Impurities - Copper (Cu)	<= 1.0 ppb	< 0.1
Trace Impurities - Gallium (Ga)	<= 20.0 ppb	< 0.2
Trace Impurities - Germanium (Ge)	<= 4.0 ppb	< 2.0
Trace Impurities - Gold (Au)	<= 4.0 ppb	0.2
Heavy Metals (as Pb)	<= 100 ppb	< 50
Trace Impurities – Iron (Fe)	<= 10.0 ppb	1.0
Trace Impurities - Lead (Pb)	<= 0.5 ppb	< 0.5

Material No.: 9598-34 Batch No.: 0000266572

Test	Specification	Result
Trace Impurities – Lithium (Li)	<= 1.0 ppb	< 0.2
Trace Impurities – Magnesium (Mg)	<= 7.0 ppb	< 0.2
Trace Impurities – Manganese (Mn)	<= 1.0 ppb	< 0.4
Trace Impurities – Mercury (Hg)	<= 0.5 ppb	< 0.1
Trace Impurities – Molybdenum (Mo)	<= 5.0 ppb	< 3.0
Trace Impurities – Nickel (Ni)	<= 1.0 ppb	< 0.3
Trace Impurities – Niobium (Nb)	<= 1.0 ppb	0.2
Trace Impurities – Potassium (K)	<= 5.0 ppb	< 2.0
Trace Impurities – Silicon (Si)	<= 20.0 ppb	0.5
Trace Impurities – Silver (Ag)	<= 1.0 ppb	< 0.3
Trace Impurities – Sodium (Na)	<= 200.0 ppb	< 0.5
Trace Impurities – Strontium (Sr)	<= 1.0 ppb	< 0.2
Trace Impurities – Tantalum (Ta)	<= 2.0 ppb	< 0.9
Trace Impurities – Thallium (TI)	<= 5.0 ppb	< 2.0
Trace Impurities – Tin (Sn)	<= 5.0 ppb	< 0.8
Trace Impurities – Vanadium (V)	<= 1.0 ppb	< 0.2
Trace Impurities – Zinc (Zn)	<= 5.0 ppb	< 0.3
Trace Impurities – Zirconium (Zr)	<= 1.0 ppb	< 0.1

For Laboratory, Research or Manufacturing Use Meets ACS Specifications

Country of Origin: US

Packaging Site: Phillipsburg Mfg Ctr & DC







# M5185, M5186, M5187, M5188, M5189, M5190

Material No.: 9606-03

Batch No.: 22C0462001

Manufactured Date: 2022-02-11

Retest Date: 2027-02-10

Revision No.: 0

# Certificate of Analysis

Test	Specification	Result
Assay (HNO₃)	69.0 - 70.0 %	69.4 %
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 (AI)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.2 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	1.7 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb
>>> Continued on page 2 >>>		





Material No.: 9606-03 Batch No.: 22C0462001

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities - Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 $\mu m$ and greater	≤ 60 par/ml	7 par/ml
Particle Count - 1.0 μm and greater	≤ 10 par/ml	2 par/ml

Nitric Acid CMOS



Material No.: 9606-03 Batch No.: 22C0462001

Test Specification Result

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



# Certified Reference Material CRM

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





Nitric Acid Solvent: 18147888 Lot # N4516 57022 Part Number: CERTIFIED WEIGHT REPORT:

Tall Mail Mail Mail Mail Mail Mail Mail M		21066	•	•		1014/000	ואווווגר אכום		1	2	7		
Lot Number: Description:	on:	111819 Titanium (Ti)		D: 10/11/0	1/19	雷				General	dry (		
					•	5.0%	40.0	Nitric Acid	Formulated By:		Lawrence Barry	111819	
Expiration Date:	ate:	111822					(mL)			7	6		
Recommended Storage:	ige:	Ambient (20 °C)	<b>်</b>						1	*	The state of the s		
Nominal Concentration (µg/mL):	n_);	1000							Ken	to the	end		
NIST Test Number:	per:	6UTB		5E-05	5E-05 Balance Uncertainty	tainty			Reviewed By:		Pedro L. Rentas	111819	
Volume shown below was diluted to (mL):	ow was dilute	ed to (mL):	1999.61	0.153	0.153 Flask Uncertainty	ηtλ							
									Expanded		SDS Information		
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solvent	(Solvent Safety Info. On Attached pg.)	hed pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette	Conc. (µg/mL)	Conc. (µg/mL) Conc. (µg/mL) Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1. Ammonium hexafluorotitanate (T)	58122	58122 010819 0.1000 199.9	0 1000	100 0	0.084	0001	10001	1000	00	16062 40.6	16062-40-6 2 5 (E) m2/m2	Š	20070
	3	2000	2001.0	0.001	0.00	200	0.10001	1000.0		0-04-70601	Z.O (r) mg/mo	NA.	31028
[1] Spe	octrum No	0.1	14.693 s	901:570	22.D# [	[1] Spectrum No.1 [ 34.693 sec]:57022.D# [Count] [Linear]	nearl						

1.0E5	[1] Spectrum No.1		[ 34.693 sec]:57022.D# [Count] [Linear]	.022.D# [C	ount] [Linee	<u>5</u>				
5.0E4										
m/z->	O <sub>F</sub>	O N	00	.4	0	0	0,	08	OG	100
1.0E8										
m/z->	0	120	130	140	150	160	170	180	190	500
2.5E7										
m/z->	010	220	230	240	250	260				





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

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

					200	וברשום	V 0 = 10 A	55	2 Cr-12	3	d/mr)						
2	<0.02	Dy	<0.02	H	<0.02	Li	<0.02	Z	<0.02	占	<0.02	Se	<0.2	TP	<0.02	×	<0.02
చి	<0.2	日	<0.02	Но	<0.02	Ţ	<0.02	SP.	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	n	<0.02
ප	<0.02	En	<0.02	П	<0.02	Mg	<0.01	õ	<0.02	Rh	<0.02	Ag	<0.02	F	<0.02	>	<0.02
౮	<0.02	В	<0.02	긔	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	묘	<0.02	χρ	<0.02
Ü	<0.02	Ça	<0.02	굜	<0.2	Hg	40.2	М	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
ර	<0.02	3	<0.02	Ę	<0.02	Mo	<0.02	꿉	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
J	<0.02	Au	<0.02	Pb	<0.02	PN	<0.02	К	<0.2	Sc	<0.02	Ta	<0.02	Έ	H	Zr	<0.02

(T)= Target analyte

## Physical Characterization:

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

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

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

\* 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 standard containers are meticulously cleaned prior to use.

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

Certified by:

Printed: 3/4/2020, 5:18:52 PM

# Certified Reference Material CRM

Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131





R:04109 120

Solvent: 19430153 Nitric Acid

58119

Part Number:

CERTIFIED WEIGHT REPORT:

022620

Pedro L. Rentas

SDS Information

Expanded

022620

Lawrence Barry Formulated By: Reviewed By: Nitric Acid MUSTICA 40.0 (mL) MUSEUS 5E-05 Balance Uncertainty 0.153 Flask Uncertainty 1999.61 Potassium (K) Ambient (20 °C) Weight shown below was diluted to (mL): 022620 022623 10000 **6UTB** Recommended Storage: Nominal Concentration (µg/mL): **Expiration Date:** Lot Number: NIST Test Number: Description:

NIST SRM (Solvent Safety Info. On Attached pg.) LD50 OSHA PEL (TWA) 5 mg/m3 1757-79-1 CAS# +/- (µg/mL) Uncertainty 20.1 Weight (g) Conc. (µg/mL) 100001 Actual 52.4848 Actual Weight (g) 52.4836 Target Purity Uncertainty Assay 38.1 8 Purity (%) 0.10 99.999 8 Conc. (µg/mL) Nominal 10000 IN034 KD012018A1 Number ĕ RM# Compound

orl-rat 3015 mg/kg 3141a [1] Spectrum No.1 [ 35.763 sec]:58119.D# [Count] [Linear] Potassium nitrate (K)

2.0E6

200

100

1 of 2

## Certified Reference Material CRM



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

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

В	В	Ве	Ba	As	Sb	Al		Total Care of	
<0.02	<0.02	<0.01	<0.02	40.2	40.02	<0.02			
Cu	င္ပ	Ç	S	င့	Ca	2			
40.02	40.02	<0.02	<0.02	40.02	40.2	40.02			
Au	Ge	Ga	8	E	ਧ	Dy			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Рь	7	Æ	ᅡ	'n	Но	ЭH			
<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02		race M	
Nd	Mo	Hg	Mn	Mg	Lu	Li		etals	
<0.02	<0.02	40.2	<0.02	<0.01	<0.02	<0.02		Verifica	
*	7	P	Pd	S <sub>O</sub>	\$	Z.		ation	
-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		by ICP	
Sc	Sm	Ru	Rb	Rh	Re	Pr		-MS	
<0.02	<0.02	<0.02	<0.02	< 0.02	<0.02	<0.02		(µg/mL)	-
Ta	S	Sr	Na	Ag	S:	Se			
<0.02	<0.02	<0.02	40.2	<0.02	<0.02	<0.2			
]	Sn	Tm	ħ	1	Te	4T	SACTION IN		Section 1
<0.02	40.02	<0.02	40.02	<0.02	<0.02	<0.02			
Zr	Zn	Υ	4,4	<	u	W	STATE OF THE PARTY		
<0.02	40.02	<0.02	40.02	40.02	<0.02	<0.02			MENTAL BOOK TO SEE AND THE REAL PROPERTY.

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

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

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

Part # 58119

Lot # 022620

# Absolute Standards, Inc. 800-368-1131

www.absolutestandards.com



# Certified Reference Material CRM

M4550 R: 02/14/20-





https://Abso	
M 4551	
	1

102519 102519 Solvent: Lot #

SDS Information

Expanded

0.153 Flask Uncertainty

1999.61

Volume shown below was diluted to (mL):

**6UTB** 1000

NIST Test Number:

Ambient (20 °C)

Recommended Storage: Nominal Concentration (µg/mL):

**Expiration Date:** 

102522

Barinm (Ba)

57056 102519

Lot Number: Description:

Part Number:

CERTIFIED WEIGHT REPORT:

	-		1	
m Com	Lawrence Barry	Hora	Pedro L. Rentas	
- Bernne	Nitric Acid Formulated By:	Harry	Reviewed By:	
	Nitric Acid			
Nitric Acid	40.0	(mL)		
18147888 Nitric Acid	2.0%		5E-05 Balance Uncertainty	
			5E-05	

									non may				
	Part	ļ	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solvent	(Solvent Safety Info. On Attached pg.)	Attached pg.)	NIST
to an	Nimber	Nimber Number	Factor	Factor Vol. (mL)	Pipette	Conc. (µg/mL)	Pipette Conc. (μg/mL) Conc. (μg/mL) Conc. (μg/mL) +/- (μg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LDSO	SRM
Dinodino	in the state of th												
					, 000	000,	0 00001	0 0000	00	40000-31-R	0 5 ma/m3	2 10000-31-8 0 5 mo/m3 onl-rat 355 mo/kg	3104a
1. Barium nitrate (Ba)	58156	58156 082019 0.1000 200.0	0.1000	200.0	0.084	UUUL	10000.0	0.0001	2.2	0-10-22001	Cillignic Co	on lat coo many	
													•

		100	000	
		0	00	
		80	180	
		02	170	
		09	160	260
		O US	150	250
		04	140	240
		06	130	230
		O	1 20 0	220
		<u>o</u>	0	210
5.0E7	2.5E7	2.0E5	m/z-> 5.0E6 2.5E6	V-2/2

Part # 57056

## Certified Reference Material CRM

Absolute Standards, Inc.

www.absolutestandards.com

300-368-1131





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

							Trace M	Metals	Verification		by ICP-MS	S (ug,	g/mL)						
ΑI	<0.02	ਲ	<0.02	à	<0.02	Ħ	<0.02	:5	<0.02	ž	<0.02	늄	<0.02	Se	<0.2	£	<0.02	3	<0.02
Sp	<0.02	చ	<0.7	山	<0.02	Но	<0.02	3	<0.02	S <sub>P</sub>	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	n	<0.02
As	<0.5	ප	<0.02	超	<0.02	ū	<0.02	Mg	40.01	°S	<0.02	Rh A	<0.02	Ag	<0.02	F	<0.02	>	<0.02
Ba	H	చ	<0.02	3	<0.02	Н	<0.02	M	<0.02	B	<0.02	Rb	<0.02	Na	<0.7	TI.	<0.05	Yb	<0.02
Be	<0.01	ე	<0.02	g	<0.02	Fe	<0.2	Hg	<0.2	Д,	<0.02	R	<0.02	Sr	<0.02	Tm	<0.05	Y	<0.02
B	<0.02	ර	<0.02	ප	<0.02	٦	<0.02	Mo	<0.02	F	<0.02	Sm	<0.02	S	<0.02	Sn	<0.05	Zu	<0.02
В	<0.02	J	<0.02	Αn	<0.02	Pb	<0.02	PN	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	ï	<0.02	1Z	<0.02
								The same of the same of					The same of the sa					-	The state of the s

(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).



## CERTIFICATE OF ANALYSIS

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

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

## 1.0 ACCREDITATION / REGISTRATION

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



## 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

 Catalog Number:
 CHEM-CLP-4

 Lot Number:
 R2-MEB694243

 Matrix:
 3% (v/v) HNO3

 3% (v/v) HF

Value / Analyte(s): 1 000 µg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

## 3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

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

## Assay Information:

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

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

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

## 4.0 TRACEABILITY TO NIST

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

## 4.1 Thermometer Calibration

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

## 4.2 Balance Calibration

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

## 4.3 Glassware Calibration

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

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

N/A

## 6.0 INTENDED USE

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

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

## 7.1 Storage and Handling Recommendations

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

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

## 8.0 HAZARDOUS INFORMATION

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

## 9.0 HOMOGENEITY

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

## 10.0 QUALITY STANDARD DOCUMENTATION

## 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

## 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

## 11.1 Certification Issue Date

June 29, 2020

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

## 11.2 Lot Expiration Date

- June 29, 2024
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRWRM can be supported by long term stability studies conducted on properly stored and handled CRWRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

## 11.3 Period of Validity

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

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

Michael 2 Booth

## 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

## Certificate Approved By:

Michael Booth Director, Quality Control

## **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

Paul R Sains

## M4590 R:07/02/2020 BH



inorganicventures.com

Christiansburg, VA 24073 · USA

## CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030 fax: 540.585.3012

info@inorganicventures.com

## 1.0 ACCREDITATION / REGISTRATION

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



## 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

 Catalog Number:
 CHEM-QC-4

 Lot Number:
 R2-MEB694244

 Matrix:
 3% (v/v) HNO3

 3% (v/v) HF

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 ± 7 μg/mL	Molybdenum, Mo	1 000 ± 5 µg/mL
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 4 μg/mL

Titanium, Ti 1 000  $\pm$  6  $\mu$ 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	070330
Sn	Calculated		See Sec. 4.2
Ti	ICP Assay	3162a	130925

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

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

## 4.0 TRACEABILITY TO NIST

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

## 4.1 Thermometer Calibration

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

## 4.2 Balance Calibration

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

## 4.3 Glassware Calibration

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

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

N/A

## 6.0 INTENDED USE

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

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

## 7.1 Storage and Handling Recommendations

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

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

## 8.0 HAZARDOUS INFORMATION

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

## 9.0 HOMOGENEITY

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

## 10.0 QUALITY STANDARD DOCUMENTATION

## 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

## 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

## 11.1 Certification Issue Date

June 29, 2020

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

## 11.2 Lot Expiration Date

- June 29, 2024
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRWRM can be supported by long term stability studies conducted on properly stored and handled CRWRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

## 11.3 Period of Validity

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

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

Michael 2 Booth

## 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

## Certificate Approved By:

Michael Booth Director, Quality Control

## **Certifying Officer:**

Paul Gaines

Chairman / Senior Technical Director

Paul R Sains

## M4599 R:8/21/2020 OP:8/24/2020 BH



## CERTIFICATE OF ANALYSIS

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

Christiansburg, VA 24073 · USA inorganicventures.com

## 1.0 ACCREDITATION / REGISTRATION

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



## 2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution

Catalog Number: CGSR10

 Lot Number:
 P2-SR681562

 Matrix:
 2% (v/v) HNO3

 Value / Analyte(s):
 10 000 μg/mL ea:

Strontium

Starting Material: SrCO3

Starting Material Lot#: M2-2192

Starting Material Purity: 99.9993%

## 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:  $10012 \pm 30 \mu g/mL$ 

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

**Assay Information:** 

Assay Method #1 9992 ± 56 μg/mL

ICP Assay NIST SRM Traceable to 3153a Lot Number: K2-SR650985

Assay Method #2 10035 ± 25 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 9997 ± 23 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 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 **w**<sub>i</sub> = 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 = bottle to bottle homogeneity standard uncertainty u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty u<sub>lts</sub> = long term stability standard uncertainty (storage) 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)

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.

```
М
  Ag <
          0.001980 M Eu <
                            0.000495 O Na
                                               0.001954 M Se <
                                                                 0.013862 O Zn
                                                                                    0.001399
0
  ΑI
          0.003619 O Fe
                            0.004005 M Nb <
                                               0.000495 i
                                                          Si <
                                                                         M Zr <
                                                                                    0.000495
М
  As <
          0.000495 M Ga <
                            0.000495 M Nd <
                                               0.000495 M
                                                          Sm <
                                                                 0.000495
М
  Au <
          0.000989 M Gd <
                            0.000495 O
                                       Ni <
                                               0.007631 M
                                                          Sn <
                                                                 0.000990
М
  B <
          0.039606 M
                     Ge <
                            0.000495 M Os <
                                               0.000494 s
                                                          Sr <
М
  Ва
          0.063290 M
                     Hf <
                            0.000495 i
                                       P <
                                                       М
                                                          Ta <
                                                                 0.000495
М
  Be <
          0.000990 M
                     Ha <
                            0.000989 M Pb <
                                               0.002970 M
                                                          Tb <
                                                                 0.000495
M
  Bi <
          0.000495 M
                     Ho <
                            0.000495 M
                                       Pd <
                                               0.003957 M
                                                          Te <
                                                                 0.027724
0
   Ca
          0.041523 M
                     In <
                            0.000495 M
                                       Pr <
                                               0.000495 M
                                                          Th <
                                                                 0.000990
M
   Cd
          0.013068 M Ir
                            0.000494 M
                                       Pt <
                                               0.002970 M
                                                          Ti <
                                                                 0.005940
                                                          TI <
M
   Ce <
          0.004950 O
                     K
                            0.008184 M
                                       Rb <
                                               0.002970 M
                                                                 0.000495
M
   Co <
          0.000495 M
                     La <
                            0.000495 M
                                       Re <
                                               0.000495 M
                                                          Tm <
                                                                 0.000495
                                               0.012829 M
0
   Cr <
          0.003207 O
                     li <
                            0.000884 O
                                       Rh <
                                                          U <
                                                                 0.001485
M
   Cs <
          0.000990 M
                     lu <
                            0.002970 M
                                       Ru <
                                               0.000989 M
                                                          V
                                                                 0.001980
M
   Cu
          0.000971 O
                     Mg
                            0.000627 i
                                        S <
                                                       M
                                                          W
                                                              <
                                                                 0.003960
M
   Dy <
          0.000495 O
                     Mn
                            0.000651 M
                                       Sb <
                                               0.014852 O Y
                                                             <
                                                                 0.000995
   Er <
          0.000495 M
                            0.001980 M Sc <
                                               0.001980 M Yb <
                                                                 0.000495
                     Mo <
```

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 <a href="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

**Atomic Weight; Valence; Coordination Number; Chemical Form in Solution -** 87.62 +2 6 Sr(H2O)6+2 **Chemical Compatibility -** Soluble in HCl, and HNO3. Avoid H2SO4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

**Stability -** 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO3 / LDPE container.

**Sr Containing Samples (Preparation and Solution) -**Metal (Best dissolved in diluted HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute 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 88 amu	1200 ppt	N/A	72Ge16O, 176Yb+2,
			176Lu+2 , 176Hf+2
ICP-OES 407.771 nm	0.0004 / 0.00006 μg/mL	1	U, Ce
ICP-OES 421.552 nm	0.0008 / 0.00004 µg/mL	1	Rb
ICP-OES 460.733 nm	0.07 / 0.003 μg/mL	1	Ce

## 8.0 HAZARDOUS INFORMATION

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

## 9.0 HOMOGENEITY

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

## 10.0 QUALITY STANDARD DOCUMENTATION

## 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

## 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

## 11.1 Certification Issue Date

August 02, 2019

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

## 11.2 Lot Expiration Date

- August 02, 2023
- 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 & inco

## 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Michael Booth Manager, Quality Control

**Certifying Officer:** 

Paul Gaines CEO, Senior Technical Director

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

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number:

58126



# Certified Reference Material CRM

08/24/20

(F)



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

Lot #

Solvent: 18147888 Nitric Acid

7.0%

210.0

Nitric Acid

Formulated By:

Giovanni Esposito

091619

Jiovanna

Japane L

(mL)

Lot Number: Description: 091619 Iron (Fe)

**Expiration Date:** 

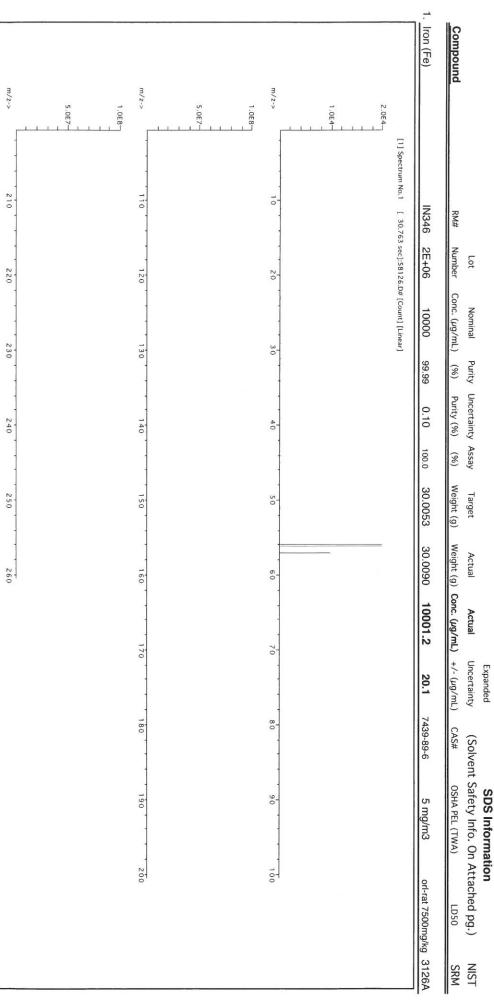
091622

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

NIST Test Number: **6UTB** 

Weight shown below was diluted to (mL): 3000.23 0.252 Flask Uncertainty 5E-05 Balance Uncertainty

Reviewed By: Pedro L. Rentas 091619



Printed: 7/10/2020, 11:39:38 PM





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

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

	u	B.	Ве	Ba	As	Sb	Α		
	٥	<0.1	<0.1	<0.1	٥	12	<0.3		
	Cu	Co	Cr	Cs	Ce	Ca	Cd		
	17	42	12	<0.1	<0.1	٥.	<0.1		
	Au	Ge	Ga	Gd	Eu	Ę	Dy		
	<0.1	40	۵	<0.1	<0.1	<0.1	<0.1		
	Pb	La	Fe	lr	In	Но	Нf		
	<0.3	<0.1	7	<0.1	<0.1	<0.1	<0.1	I race N	
	Nd	Мо	Hg	Mn	Mg	Lu	Ľ.	Metals	
(T) - Target analyte	<0.1	5	<0.1	110	< 0.5	<0.1	<0.1	Verification	
-	×	Pł	P	Pd	Os	Ŋ	Ž.	tion	
,	5	<0.1	<0.1	<0.1	<0.1	<0.1	22	by ICP-M	
	Sc	Sm	Ru	Rb	Rh	Re	Pr	S (µg	
	<0.1	<0.1	<0.1	<0.1	<0.1	< 0.1	<0.1	/L)	
	Ta	s	Sr	N <sub>a</sub>	Age	S:	Se		
	<0.1	<0.1	<0.1	٥	<0.1	<10	<0.5		
	Ti	Sn	Tm	Th	∃	Te	Tb		
	<0.1	۵	<0.1	<0.1	<0.1	<0.1	<0.1		
	Zr	Zn	Υ	Υb	<	⊂	W		
	<0.1	<0.1	<0.1	<0.1	<0.3	<0.3	<0.1		

(1)= 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).

## OP:08/24/2020 R: 08/21/2020 BH M4629



## CERTIFICATE OF ANALYSIS

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

Christiansburg, VA 24073 · USA inorganicventures.com

## 1.0 ACCREDITATION / REGISTRATION

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



## 2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution

Catalog Number: CGSR1

 Lot Number:
 P2-SR683295

 Matrix:
 0.1% (v/v) HNO3

Value / Analyte(s): 1 000 μg/mL ea:

Strontium

Starting Material: SrCO3
Starting Material Lot#: M2-2192
Starting Material Purity: 99.9993%

## 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:  $1001 \pm 5 \mu g/mL$ 

**Density:** 1.001 g/mL (measured at 20  $\pm$  4 °C)

**Assay Information:** 

Assay Method #1 997  $\pm$  4  $\mu$ g/mL

ICP Assay NIST SRM Traceable to 3153a Lot Number: K2-SR650985

Assay Method #2  $1002 \pm 3 \mu g/mL$ 

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3  $1001 \pm 2 \mu g/mL$ 

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 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 **w**<sub>i</sub> = 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 = bottle to bottle homogeneity standard uncertainty u<sub>bb</sub> = bottle to bottle homogeneity standard uncertainty u<sub>lts</sub> = long term stability standard uncertainty (storage) 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)

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.

```
М
  Ag <
          0.001980 M Eu <
                            0.000495 O Na
                                               0.000201 M Se <
                                                                 0.013862 O Zn
                                                                                    0.000143
0
  ΑI
          0.000372 O Fe
                            0.000412 M Nb <
                                               0.000495 i
                                                          Si <
                                                                         M Zr <
                                                                                    0.000495
М
  As <
          0.000495 M Ga <
                            0.000495 M Nd <
                                               0.000495 M Sm <
                                                                 0.000495
М
  Au <
          0.000989 M Gd <
                            0.000495 O
                                       Ni <
                                               0.007631 M
                                                          Sn <
                                                                 0.000990
М
  B <
          0.039606 M
                     Ge <
                            0.000495 M Os <
                                               0.000494 s
                                                          Sr <
М
  Ва
          0.006511 M
                     Hf <
                            0.000495 i
                                       P <
                                                       М
                                                          Ta <
                                                                 0.000495
М
  Be <
          0.000990 M
                     Ha <
                            0.000989 M Pb <
                                               0.002970 M
                                                          Tb <
                                                                 0.000495
M
  Bi <
          0.000495 M
                     Ho <
                            0.000495 M
                                       Pd <
                                               0.003957 M
                                                          Te <
                                                                 0.027724
0
   Ca
          0.004272 M
                     In <
                            0.000495 M
                                       Pr <
                                               0.000495 M
                                                          Th <
                                                                 0.000990
M
   Cd
          0.001344 M Ir
                            0.000494 M
                                       Pt <
                                               0.002970 M
                                                          Ti <
                                                                 0.005940
                                                          TI <
M
   Ce <
          0.004950 O
                     K
                            0.008184 M
                                       Rb <
                                               0.002970 M
                                                                 0.000495
M
   Co <
          0.000495 M
                     La <
                            0.000495 M
                                       Re <
                                               0.000495 M
                                                          Tm <
                                                                 0.000495
                                               0.012829 M
0
   Cr <
          0.003207 O
                     li <
                            0.000884 O
                                       Rh <
                                                          U <
                                                                 0.001485
M
   Cs <
          0.000990 M
                     lu <
                            0.002970 M
                                       Ru <
                                               0.000989 M
                                                          V
                                                                 0.001980
M
   Cu
          0.000099 O
                     Mg
                            0.000064 i
                                        S <
                                                       M
                                                          W
                                                              <
                                                                 0.003960
M
   Dy <
          0.000495 O
                     Mn
                            0.000067 M
                                       Sb <
                                               0.014852 O Y
                                                             <
                                                                 0.000995
   Er <
          0.000495 M
                            0.001980 M Sc <
                                               0.001980 M Yb <
                                                                 0.000495
                     Mo <
```

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 <a href="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

**Atomic Weight; Valence; Coordination Number; Chemical Form in Solution -** 87.62 +2 6 Sr(H2O)6+2 **Chemical Compatibility -** Soluble in HCl, and HNO3. Avoid H2SO4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

**Stability -** 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO3 / LDPE container.

**Sr Containing Samples (Preparation and Solution) -**Metal (Best dissolved in diluted HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute 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 88 amu	1200 ppt	N/A	72Ge16O, 176Yb+2,
			176Lu+2 , 176Hf+2
ICP-OES 407.771 nm	0.0004 / 0.00006 μg/mL	1	U, Ce
ICP-OES 421.552 nm	0.0008 / 0.00004 µg/mL	1	Rb
ICP-OES 460.733 nm	0.07 / 0.003 μg/mL	1	Ce

## 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

October 10, 2019

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

## 11.2 Lot Expiration Date

- October 10, 2023
- 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 & inco

## 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Michael Booth Manager, Quality Control

**Certifying Officer:** 

Paul Gaines CEO, Senior Technical Director

## Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



## Certified Reference Material CRM

MKBQ8597V



Formulated By:

Reviewed By:

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

082019

082019

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>57042</u> Lot Number: 082019

Description: Molybdenum (Mo)

0.5% 10.0 Ammonium hydroxid

Ammonium hydroxide

082022 (mL)

Nominal Concentration (µg/mL): 1000

**Expiration Date:** 

Recommended Storage:

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

Ambient (20 °C)

Volume shown below was diluted to (mL): 1999.61 0.153 Flask Uncertainty

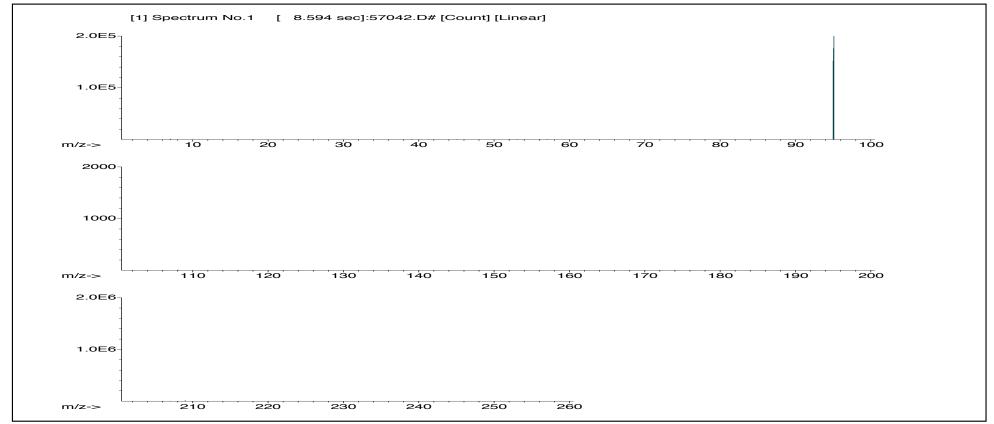
Expanded SDS Information

Lawrence Barry

Pedro L. Rentas

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

1. Ammonium molybdate (Mo) 58142 051619 0.1000 199.9 0.084 1000 10001.2 **1000.0 2.2** 13106-76-8 5 mg(Mo)/m3 orl-rat 333 mg/kg 3134



## Certified Reference Material CRM



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

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

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

(T)= Target analyte

## **Physical Characterization:**

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

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

Certified by:

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



## Certified Reference Material CRM

4494W

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

m/z->	1.0∈7	m/z-> 2.0E7	N. 55	m/z->	N. 55 E. 5	5.OM	1. Antimony (Sb)	Compound	Nominal Concentration (µg/mL):  NIST Test Number:  Volume shown below w	Recomm		CERTIFIED WEIGHT REPORT:
N	,					[1] Spectrum No.1			Concentration (µg/mL): 1000  NIST Test Number: 23060  Volume shown below was diluted to (mL):	Expiration Date:	Part Number: Lot Number: Description:	ORT:
210		110		10		3 7	58151	Part	vas dilute			
220		N 0		20		_	091819	Lot	1000 23060 ed to (mL):	052123	57051 052120 Antimony (Sb)	
230		130		30		7.964 8	0.1000	Dilution	1999.61	Ž	<u>Sb)</u>	
0		O		•		ec]:580	199.9	<u> </u>	5E-05			
240		140		40		051.D#[C	0.084	Uncertainty Pipette (	Balance Uncertainty Flask Uncertainty			,
250		150		50		17.964 sec]:58051.D# [Count] [Linear]	1000	Nominal Conc. (µg/mL)	inty	2.0%	19430153	Lot#
260		160		80		near]	10000.8	Initial Conc. (µg/mL)		(mL)	Nitric Acid	Solvent:
				N			1000.0	Initial Final Conc. (µg/mL) Conc. (µg/mL)		Nitne Acid		
		170		70			2.2	Expanded Uncertainty +/- (µg/mL)	Reviewed By:	Formulated By:	1	
		180		80			7440-36-0	(Solve	i di	/ k	Ewone	
		190		90			0.5 mg/m3	SDS information ent Safety Info. On Atta OSHA PEL (TWA)	Pedro L. Rentas	Lawrence Barry	Can	
ž		200		100			orl-rat 100 mg/kg	SDS Information (Solvent Safety Info. On Attached pg.)  OSHA PEL (TWA) LD50	s 052120	052120		
							3102a	NIST	[8]			

Printed: 10/8/2020, 12:02:19 PM



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

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

Al d002 Cd d002 Dy d002 Hf d002 Li d002 Ni d002 Pr d002 Se d02 Tb d002  Sb T Ca d0.2 Er d002 Ho d002 Lu d002 Nb d002 Rc d002 Si d002 Te d002  As d0.2 Cc d002 Eu d002 Ir d002 Mg d011 Os d002 Rb d002 Na d0.2 Tr d002  Ba d002 Cs d002 Ga d002 Fe d0.2 Hg d0.2 Pr d0.02 Rb d0.02 Sr d0.02 Th d0.02  Bi d002 Cu d002 Ge d0.02 Pr d0.02 Nb d0.02 Ru d0.02 Sr d0.02 Th d0.02  Bi d002 Cu d0.02 Au d0.02 Pr d0.02 Nb d0.02 Sr d0.02 Tr d0.02  Bi d002 Cu d0.02 Au d0.02 Pr d0.02 Nb d0.02 Sr d0.02 Tr d0.02  Bi d002 Cu d0.02 Au d0.02 Pr d0.02 Nb d0.02 Sr d0.02 Tr d0.02  Bi d002 Cu d0.02 Au d0.02 Pr d0.02 Nb d0.02 Sr d0.02 Tr d0.02	١	The second line of the least of	The state of the latest and the late		The second second		Charles Contraction		-		-								
4002         Cd         4002         Dy         4002         Hf         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Tb           T         Ca         40.2         Er         40.02         Ho         40.02         Nb         40.02         Rc         40.02         Si         40.02         Te           40.2         Cc         40.02         Eu         40.02         In         40.02         Mg         40.01         Os         40.02         Rh         40.02         Ag         40.02         Tr           40.01         Cs         40.02         Gd         40.02         Ir         40.02         Pd         40.02         Rb         40.02         Na         40.2         Th           40.01         Cr         40.02         Ga         40.02         Fe         40.2         P         40.02         Ru         40.02         Sr         40.02         Tn           40.02         Co         40.02         Ge         40.02         La         40.02         Pr         40.02         Sm         40.02         S         40.02         Sn		<0.02	T	<0.02	Ta	40.02	Sc	40.2	~	<0.02	Nd	<0.02	Pb	40.02	Au	40.02	Cl	20.02	a
4002         Cd         4002         Dy         4002         Hf         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Tb           T         Ca         40.2         Er         40.02         Ho         40.02         Lu         40.02         Nb         40.02         Re         40.02         Si         40.02         Te           40.2         Ce         40.02         Eu         40.02         In         40.02         Mg         40.01         Os         40.02         Rh         40.02         Th           40.01         Cs         40.02         Gd         40.02         Ir         40.02         Pd         40.02         Rb         40.02         Na         40.2         Th           40.01         Cr         40.02         Ga         40.02         Fe         40.2         Pd         40.02         Ru         40.02         Sr         40.02         Th		<0.02	Sn	< 0.02	S	<0.02	Sm	<0.02	Þ	<0.02	Mo	<0.02	7	40.02	ရှ	40.02	S	40.02	, 5
4002         Cd         4002         Dy         4002         Hf         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Tb           T         Ca         40.2         Er         40.02         Ho         40.02         Lu         40.02         Nb         40.02         Re         40.02         Te           40.2         Ce         40.02         Eu         40.02         In         40.02         Mg         40.01         Os         40.02         Rh         40.02         Th           40.02         Cs         40.02         Gd         40.02         Ir         40.02         Pd         40.02         Rb         40.02         Na         40.2         Th		<0.02	Tm	<0.02	Sr	<0.02	Ru	<0.02	*0	40.2	AH.	0.2	Fe	40.02	Ga	€0.02	ŭ	0.01	Ве
4002         Cd         4002         Dy         4002         Hf         4002         Li         4002         Ni         4002         Pr         4002         Se         402         Tb           T         Ca         40.2         Er         40.02         Ho         40.02         Lu         40.02         Nb         40.02         Re         40.02         Si         40.02         Te           40.2         Ce         40.02         Eu         40.02         In         40.02         Mg         40.01         Os         40.02         Rh         40.02         Ag         40.02         Tl		<0.02	7	402	Na	40.02	Rb	0.02	Pd	40.02	Mn	€0.02	fr	40.02	8	<0.02	S	<0.02	1 10
4002         Cd         4002         Dy         4002         Hf         4002         Li         4002         Ni         4002         Pr         4002         Tb           T         Ca         40.2         Er         40.02         Ho         40.02         Lu         40.02         Nb         40.02         Re         40.02         Si         40.02         Te		<0.02	ı	<0.02	Ag	40.02	Rh	△0.02	0°	40.01	N S	40.02	Б	<0.02	E	<0.02	င့	40.2	As
40.02 Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se 40.2 Tb		<0.02	Te	<0.02	Si	40.02	Re	<0.02	N	<0.02	Ē	40.02	Но	40.02	먁	0.2	Ca	-	Sb
	- 1	<0.02	4	402	Se	<0.02	P	40.02	Z	<0.02	L	<0.02	Hf	<0.02	Dy	40.02	2	<0.02	A
							0	N ICD N	‡.	Varifica	Motole	Trace M							(0000

(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).

Part # 57051

Printed: 10/8/2020, 12:02:19 PM

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

www.absolutestandards.com



Certified Reference Material CRM 20/28/20

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

CERTIFIED WEIGHT REPORT: M4656 Lot #

Solvent: 19430153 Nitric Acid

2% (mL) 20.0 Nitric Acid

**Expiration Date:** 

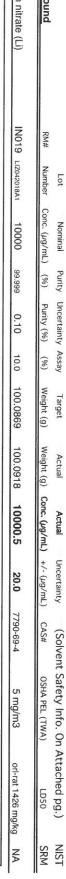
010323

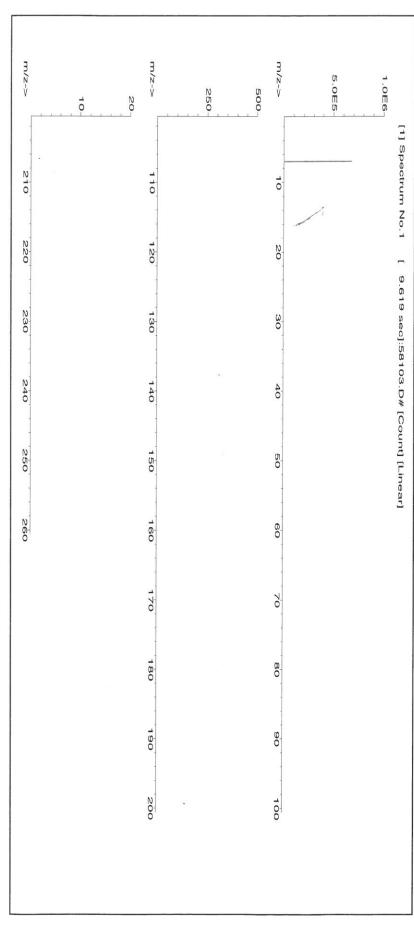
Part Number: Lot Number: Description:

57103 010320 Lithium (Li)

1. Lithium nitrate (Li) Nominal Concentration (µg/mL): Weight shown below was diluted to (mL): Recommended Storage: NIST Test Number: IN019 LIZ042018A1 RM# Ambient (20 °C) 10000 6UTB Number Lot Conc. (µg/mL) 1000.86 10000 Nominal 0.058 Flask Uncertainty 99,999 5E-05 Balance Uncertainty Purity Uncertainty Assay (%) Purity (%) 0.10 10.0 (%) Weight (g) 100.0869 Target Weight (g) 100.0918 Actual Conc. (µg/mL) 10000.5 Actual +/- (µg/mL) Uncertainty Reviewed By: Expanded 20.0 7790-69-4 CAS# (Solvent Safety Info. On Attached pg.) Pedro L. Rentas OSHA PEL (TWA) **SDS Information** 010320

Formulated By: Lawrence Barry 010320





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

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

<0.02 W
<0.2 Tb <0.02 W

(T)= Target analyte

Certified by:

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

**Physical Characterization:** 

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

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

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

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

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

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

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

## Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



## Certified Reference Material CRM

19410105

Nitric Acid

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

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

Description: Chromium (Cr)

2.0% 40.0 082623 (mL)

Uncertainty

Initial

Recommended Storage: Ambient (20 °C)

Part

Nominal Concentration (µg/mL): 1000

**Expiration Date:** 

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

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

Lot

Formulated By: Lawrence Barry 082620

Lawrence Barry 082620

Reviewed By: Pedro L. Rentas 082620

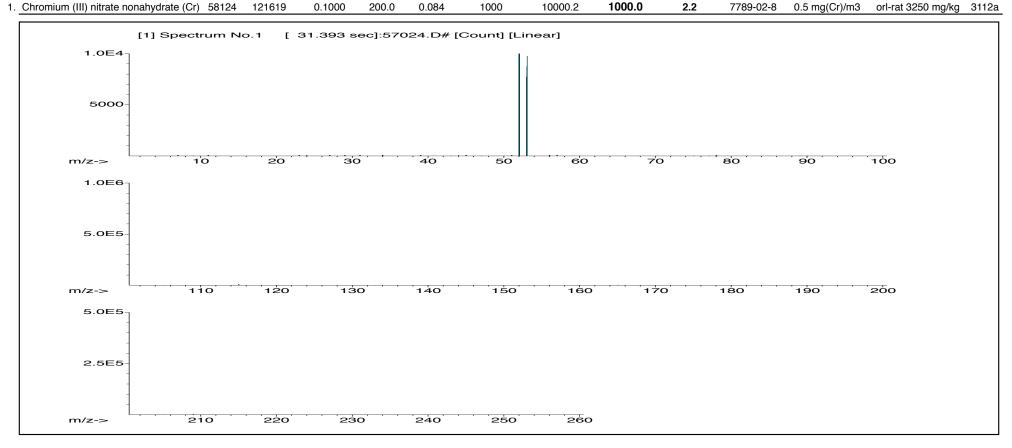
**SDS Information** 

(Solvent Safety Info. On Attached pg.)

Compound

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

Nominal



## Certified Reference Material CRM



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

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

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

(T)= Target analyte

## Physical Characterization:

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

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

Certified by:

Bu f. All



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

R:02/20/20 50

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 CLP SOWs 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

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

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,

Page 1 of 2







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

R1.02/20/20

**APTIM** 

## 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) 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

BREESE STORY	THE KENDY						
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	254900	203920	305880	246800	197440	296160
Sb	60	(0)*	-60	60	618	494	742
As	10	(0)	-10	10	104	83	125
Ba	200	(6)	-194	206	(537)	337	737
Be	5	(0)	-5	5	495	396	594
Cd.	5	(1)	-4	6	972	778	1166
Ca	5000	244500	195600	293400	234900	187920	281880
Cr -	10	52	42	62	542	434	650
Co '	50	(0)	-50	50	476	381	571
Cu	25	(2)	-23	27	511	409	613
Fe	100	100700	80560	120840	99320	79456	119184
Pb	10	(0)	-10	10	(49)	39	59
Mg	5000	255400	204320	306480	248000	198400	297600
Mn	15	(7)	-8	22	507	406	608
Ni	40	(2)	-38	42	954	763	1145
Se	35	(0)	-35	35	(46)	11	81
Ag	10	(0)	-10	10	201	161	241
TI	25	(0)	-25	25	(108)	83	133
V	50	(0)	-50	50	491	393	589
Zn	60	(0)	-60	60	952	762	1142

<sup>\*</sup> 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  $\pm$  20 percent of the listed certified value.

205/4 M4692 N4693 N4694 N4694 N4696 M4697

> N4698 N4699

M 4700

BH

## M4707 R:08/21/2020 BH



inorganicventures.com

Christiansburg, VA 24073 · USA

## CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030 fax: 540.585.3012

info@inorganicventures.com

## 1.0 ACCREDITATION / REGISTRATION

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



## 2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution

Catalog Number: CGV1

Lot Number: P2-V685591

Matrix: 2% (v/v) HNO3

Value / Analyte(s): 1 000 μg/mL ea:

Vanadium

Starting Material: V2O5

Starting Material Lot#: 1782

Starting Material Purity: 99.9939%

## 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:  $1002 \pm 4 \mu g/mL$ 

**Density:** 1.016 g/mL (measured at 20  $\pm$  4 °C)

**Assay Information:** 

Assay Method #1  $1004 \pm 5 \mu g/mL$ 

ICP Assay NIST SRM 3165 Lot Number: 160906

Assay Method #2 1002 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 928

Assay Method #3  $1000 \pm 3 \mu g/mL$ 

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 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 **w**<sub>i</sub> = 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 = 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)

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.

```
М
  Ag <
          0.000273 M Eu <
                            0.000118 O Na
                                               0.010915 M Se <
                                                                 0.001167 M Zn <
                                                                                    0.006080
М
  ΑI
          0.006218 M Fe
                            0.023106 M Nb <
                                               0.001479 O
                                                          Si
                                                                 0.036363 M Zr <
                                                                                    0.003181
М
  As <
          0.000540 M Ga <
                            0.009451 M Nd <
                                               0.000118 M Sm <
                                                                 0.000118
М
  Au <
          0.000191 M Gd <
                            0.000118 M Ni <
                                               0.003169 M Sn <
                                                                 0.000733
М
  B <
          0.002950 M
                     Ge <
                            0.000434 M Os <
                                               0.000150 M Sr
                                                                 0.000060
M
  Ba <
          0.001024 M
                     Hf <
                            0.000118 O P <
                                               0.056000 M
                                                          Ta <
                                                                 0.000118
М
   Be <
          0.000118 M
                     Ha <
                            0.000170 M Pb
                                               0.000241 M
                                                          Tb <
                                                                 0.000118
M
  Bi <
          0.000363 M
                     Ho <
                            0.000118 M Pd <
                                               0.000140 M
                                                          Te <
                                                                 0.002236
0
   Ca
          0.011869 M In <
                            0.000118 M Pr <
                                               0.000118 M
                                                          Th <
                                                                 0.000118
M
   Cd <
          0.000145 M Ir
                            0.000118 M Pt <
                                               0.000118 M
                                                          Τi
                                                                 0.001386
                                                          TI <
M
   Ce <
          0.000245 M K
                            0.002082 M Rb <
                                               0.000118 M
                                                                 0.000118
M
   Co <
          0.000119 M La <
                            0.000118 M Re <
                                               0.000118 M
                                                          Tm <
                                                                 0.000118
0
   Cr
          0.017206 M
                     li <
                            0.000501 M Rh <
                                               0.000118 M
                                                          U <
                                                                 0.000395
M
   Cs
          0.000477 M
                     Lu <
                            0.000118 M Ru <
                                               0.000118 s
                                                          V
M
   Cu <
          0.002021 M
                     Mg
                            0.000612 n
                                       S <
                                                       M
                                                         W
                                                                 0.000174
   Dy <
М
          0.000118 M
                     Mn
                            0.000649 M
                                       Sb
                                               0.008706 M Y
                                                                 0.000118
  Er <
          0.000118 O
                            0.007182 M Sc <
                                               0.000118 M Yb <
                                                                 0.000118
                     Mο
```

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 <a href="www.inorganicventures.com/TCT">www.inorganicventures.com/TCT</a>

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 50.94 +5 6 H2V10O284-Chemical Compatibility -Soluble in HCl, HNO3, H2SO4, HF, H3PO4 and strong basic media. Stable with most metals and inorganic anions in acidic media.

**Stability -** 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

**V Containing Samples (Preparation and Solution) -**Metal (Fusion with NaOH or KOH in Ni0 or Na2CO3 / KNO3); Oxides (V2O3 - use HCl, V2O4 - use HCl or HNO3, V2O5 - use concentrated acids); Ores (Na2CO3 / KNO3 in Pt0 caution - nitrates attack Pto followed by water extraction of fuseate); Organic Matrices (Ash at 450 EC followed by dissolving according to V2O5 above).

## 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 51 amu	4 ppt	N/A	34S16O1H,
			35Cl16O, 38Ar13C,
			36Ar15N,
			36Ar14N1H,
			37Cl14N,36S15N,
			33S18O, 34S17O,
			102Ru+2,02Pd+2
ICP-OES 290.882 nm	0.008 / 0.0008 µg/mL	1	Hf, Nb
ICP-OES 292.402 nm	0.006 / 0.001 µg/mL	1	Th
ICP-OES 309.311 nm	0.005 / 0.001 µg/mL	1	Mg, U, 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: 540.585.3012; inorganicventures.com; info@inorganicventures.com

## 11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

## 11.1 Certification Issue Date

December 05, 2019

- 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

- December 05, 2023
- 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.

Michael 2 Booth

## 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Manager, Quality Control

**Certifying Officer:** 

Paul Gaines CEO, Senior Technical Director

MANS Certified Reference Material CRIM



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

Manganese (I	Compound					Nomina							CERTIFIED WEIGHT REPORT:
1. Manganese (II) nitrate tetrahydrate (Mn) 58125				Volume shown below was diluted to (mL):	NIST Test Number:	Nominal Concentration (µg/mL):	Recommended Storage:	Expiration Date:		Description:	Lot Number:	Part Number:	HI REPORT:
58125	Number	Part		vas dilut									
010720	Number	듗		ed to (mL):	23060	1000	Ambient (20 °C)	070623		Manganese (Mn)	070620	58025	
0.1000	Factor	Dilution		1999.61			<u>ග</u>			e (Mn)			
199.9	Vol. (mL)	Initial		0.153	5E-05								
0.084	Pipette (mL)	Initial Uncertainty		Flask Uncertainty	<b>Balance Uncertainty</b>								
1000	Vol. (mL) Pipette (mL) Conc. (µg/mL)	Nominal		Ψ̈	lainty				2.0%			19410105	Lot #
10000.7	Conc. (µg/mL)	Initial						(mL)	40.0			Nitric Acid	Solvent:
1000.0	Conc. (µg/mL) +/- (µg/mL)	Final		M 1	2			ν,	Nitric Acid				
2.2	+/- (µg/mL)	Uncertainty	Expanded		Reviewed By:	Ku	1		Formulated By:		1		
20694-39-7	CAS#	(Solver			••	1	s'	7	y:		amone.		
5 mg/m3	OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)	SDS Information		Pedro L. Rentas	late	R	7	Lawrence Barry		amp	7	
orl-rat >300mg/kg 3132	LD50	Attached pg.)	lion		070620				070620				
3132	SRM	TSIN			<u>-1</u>								

m/z->	5.0E7	m/z->	5.0E7	m/z->	N O M	5.0E6
į						
270		110		0		
		0				
220		120		20		
0		0				
230		130		30		
o,		Ü				
240		140		4		
		Ŭ,				
250		50		S O		
				11		_
N 0		160		00		
		170		70		
		•				
		180		80		
		190		90		
		å.				
		200		100		

www.absolutestandards.com

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

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

			5				Trace M	vietals	Verification	tion	by ICP-MS	S (µc	J/mL)						
AI	4000	3	A) (3)	Į.	A003	H	3		A	N.	3	P.	20.03	c.		1	3	W	3
4S	<0.02	<u>ر</u>	40.2	E ?	<b>∆</b> .02	H :	6002	Ę i	A) (2)	8 3	A).02	Re :	0.02	S: S	A)02	Te t	A).02	C \$	A 6.02
As	40.2	င္ပ	<0.02	딸	<0.02	5	<0.02	Mg	40.01	0S	<0.02	R	40.02	Ag	40.02	∄	40.02	<	<0.02
Ва	<0.02	ಬ	<0.02	8	<0.02	Г	<0.02	Mn	T	Pd	<0.02	Rb	<0.02	Na	40.2	Ħ	<0.02	4	40.02
Ве	10.05	ζ	<0.02	Ga	<0.02	Fe	<02	Hg	402	P	<0.02	Ru	<0.02	Sr	<0.02	Tim	<0.02	×	<0.02
Bi	40.02	င္ပ	<0.02	င္ပ	<0.02	L	<0.02	Mo	<0.02	77	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	△0.02
В	<0.02	C	<0.02	Au	<0.02	73	<0.02	M	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	∄	<0.02	21	40.02
									T=(T)	(T)= Tarnet analyte	nalvte								

(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 balances that are calibrated with weights traceable to NIST (see above).

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

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

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

Certified by:

800-368-1131 www.absolutestandards.com



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



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

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

www.absolutestandards.com



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

	В	; <u>B</u>	De Be	Da	P 48	<b>&gt;</b> C	£ 5	ΔΙ			
	<0.02	<0.02	<0.01	<0.02	2.02	20.02	20.02	20.00			
	Cu	60	, <del>.</del>	S	, e	3	. E	2			
	<0.02	<0.02	<0.02	<0.02	<0.02	2.02	20.02	2003			
	Au	Ge	Ga	Gd	Eu	1 [	ī. Uy				
	<0.02	< 0.02	<0.02	<0.02	<0.02	<0.02	<0.02				
	РЬ	La	Fe	İr	In	Но	: #				
	<0.02	< 0.02	<0.2	<0.02	<0.02	<0.02	<0.02			Trace V	
	N	Mo	Hg	Mn	Mg	Lu	΄ Σ			letals	
	<0.02	< 0.02	<0.2	<0.02	<0.01	<0.02	<0.02			Verifica	
;	_	7	P	Pd	Os	N	Z			tion	
10.1	<02	<0.02	< 0.02	< 0.02	< 0.02	<0.02	-			by ICP-N	
90	s	Sm	Ru	Rb	Rh	Re	Ρ.		<	( ) S	
70.02	200	<0.02	< 0.02	< 0.02	< 0.02	<0.02	< 0.02		9/ 1111/	n/ml)	
1a	3	S	Sr	Na	Ag	Si	Se				
V0.02	200	<0.02	<0.02	<0.2	< 0.02	<0.02	<0.2				
=		Sn	Tm	Th	T	Te	Ть				
<0.02	000	<0.02	<0.02	<0.02	< 0.02	< 0.02	< 0.02				
17	7 !	7 <sub>n</sub>	~	Υb	<	U	W				
<0.02	0.00	<0.00	<0.02	<0.02	<0.02	<0.02	< 0.02				

(T)= Target analyte

## **Physical Characterization:**

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

Certified by:

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

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

www.absolutestandards.com



### |\(\lambda\) \(\lambda\) |\(\lambda\) |\(\la R: IVIVA





ISO 17034 Accredited Scopes: http://AbsoluteStandards.com

CERTIFIED WEIGHT REPORT: Aluminum nitrate nonahydrate (Al) Nominal Concentration (µg/mL): m/z-> m/z-> m/z-> Recommended Storage: Weight shown below was diluted to (mL): 1.0 € 6 2.0E6 2.5E6 5.0E6 2.5E5 5.0E5 **NIST Test Number:** Expiration Date: Part Number: Description: Lot Number: [1] Spectrum No.1 210 110 0 IN022 ALD012018A1 RM# 58113 072519 **BTU9** 10000 Ambient (20 °C) 072522 Aluminum (Al) Number ē 220 120 20 [ 15.014 sec]:58113.D# [Count] [Linear] Conc. (µg/mL) 1999.61 Nominal 10000 230 130 30 0.153 Flask Uncertainty 99,999 5E-05 Balance Uncertainty Purity Uncertainty Assay (%) Purity (%) 0.10 240 140 40 Solvent: 18147888 Nitric Acid 6.89 8 2% 250 150 290.3479 Weight (g) Target 50 Lot # (III) 40.0 290.3529 Nitric Acid Weight (g) Conc. (µg/mL) Actual 260 160 60 10000.2 Actual 170 70 +/- (µg/mL) Reviewed By: Formulated By: Uncertainty Expanded 20.1 180 80 7784-27-2 CAS# (Solvent Safety Info. On Attached pg.) Pedro L. Rentas Lawrence Barry 190 OSHA PEL (TWA) ento SDS Information 90 2 mg/m3 200 100 ort-rat 3671 mg/kg 3101a LD50 072519 072519 TSIN SRM

Scopes: http://AbsoluteStandards.com ISO 17034 Accredited

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

								Trace Me	<b>Vetals</b>	Verifica	tion	by ICP-	SM	µg/mL)						
_	A	Н	δ	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Z.	<0.02	Pr	<0.02	Se	40.2	41	<0.02	¥	A002
	Sb	<0.02	Ç	40.2	펵	<0.02	Но	40.02	Ę	40.02	ş	<0.02	Re	40.02	Z:	<0.02	ਜ਼ੋ -	40.02	= :	000
1	As	40.2	င္ပ	<0.02	昛	<0.02	In	40.02	Mg	40.01	õ	<0.02	R.	A .02	Ag	<0.02	1	A) (2)	<	2 2
	Ва	<0.02	S	<0.02	6	<0.02	Ľ,	<0.02	M	40.02	Pd	<0.02	R <sub>b</sub>	40.02	N o	40.2	∄	<0.02	ş .	A 600
-	Ве	40.01	ರ	<0.02	Ga	<0.02	Fe	40.2	Hg	40.2	P	<0.02	Ru	40.02	Ş	40.02	i i	40.02	<	2000
	Bi	<0.02	င	<0.02	G	<0.02	La	40.02	Mo	40.02	7	<0.02	Sm	40.02	S	40.02	3	400	7,	2 3
	В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	40.02	×	40.2	Sc	40.02	Ta	<0.02	∄	40.02	7.	4000
																	Name and Address of the Owner, where			

## **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.
- \* 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 # 58113

800-368-1131 www.absolutestandards.com

Compound



### Certified Reference Material CRM

19410105

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Conc. ( $\mu$ g/mL) Conc. ( $\mu$ g/mL)

Expanded

Uncertainty

+/- (μg/mL)



CAS#

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

LD50

NIST

SRM

CERTIFIED WEIGHT REPORT: Lot # Solvent:

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

Description: Cobalt (Co)

Part

Number

Expiration Date: 020824

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

Factor

Initial

Uncertainty

Vol. (mL) Pipette (mL) Conc. ( $\mu$ g/mL)

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

Lot

Number

Formulated By: Lawrence Barry 020821

Serviewed By: Pedro L. Rentas 020821

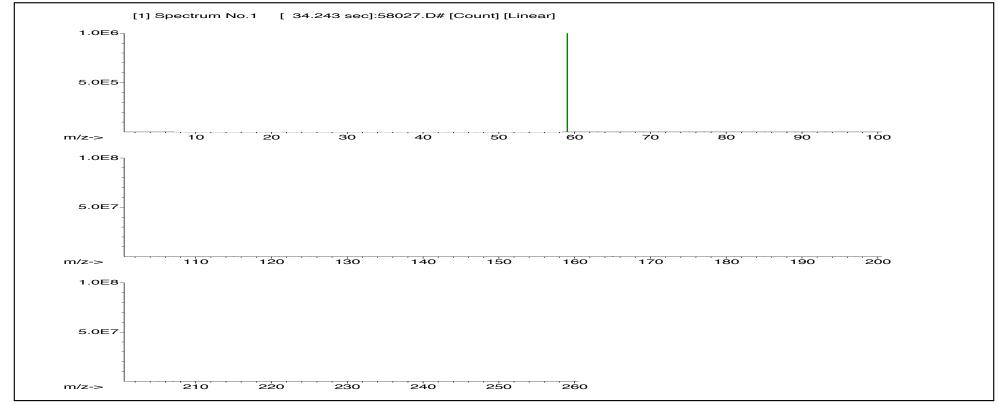
**SDS Information** 

(Solvent Safety Info. On Attached pg.)

OSHA PEL (TWA)

1. Cobalt nitrate hexahydrate (Co) 58127 062320 0.1000 200.0 0.084 1000 10000.1 **1000.0 2.2** 10026-22-9 5 mg/m3 orl-rat 694 mg/kg 3113

Nominal





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

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

Bu P. Sha

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM



Expanded

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

**CERTIFIED WEIGHT REPORT:** Lot #

> Part Number: 57182 Solvent: 20370011 Nitric Acid

Lot Number: 032321 **Description:** Lead (Pb)

> 2% 40.0 Nitric Acid 032324

(mL)

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

Nominal Concentration (µg/mL): 10000

**Expiration Date:** 

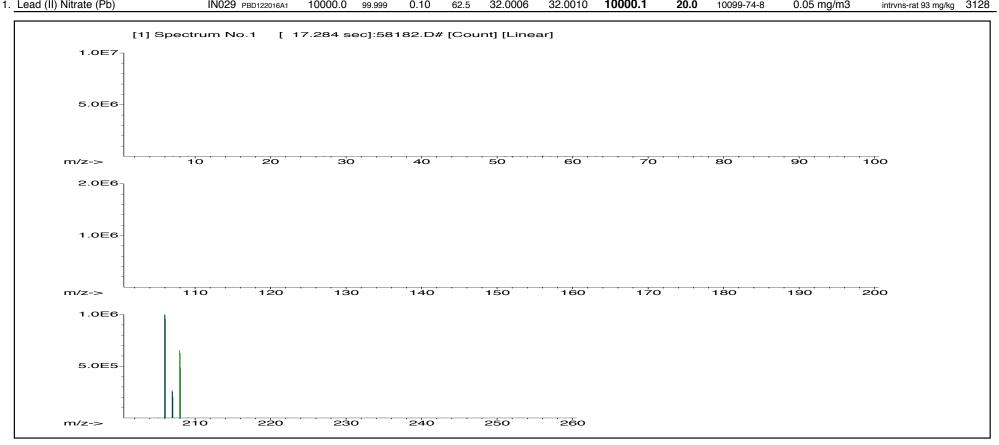
**NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

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

Formulated By: Lawrence Barry 032321 Reviewed By: Pedro L. Rentas 032321

**SDS Information** 

	Lot	Nominal Puri	ty Uncertainty A	Assay	Target	Actual	Actual	Uncertainty	(Solv	ent Safety Info. On At	tached pg.)	NIST
Compound	RM# Number	Conc. (µg/mL) (%	) Purity (%)	(%)	Weight (g)	Weight (g)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1 Lood (II) Nitrato (Db)	INIO20	10000 0	0.10	00.5	20,0006	22 0010	10000 1	20.0	10000 74 0	0.05 mg/m2		2100





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

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

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

(T)= Target analyte

### **Physical Characterization:**

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

Certified by:

But All

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



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

19410105

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57033

 Lot Number:
 012521

Description: Arsenic (As)

**Expiration Date:** 012524

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

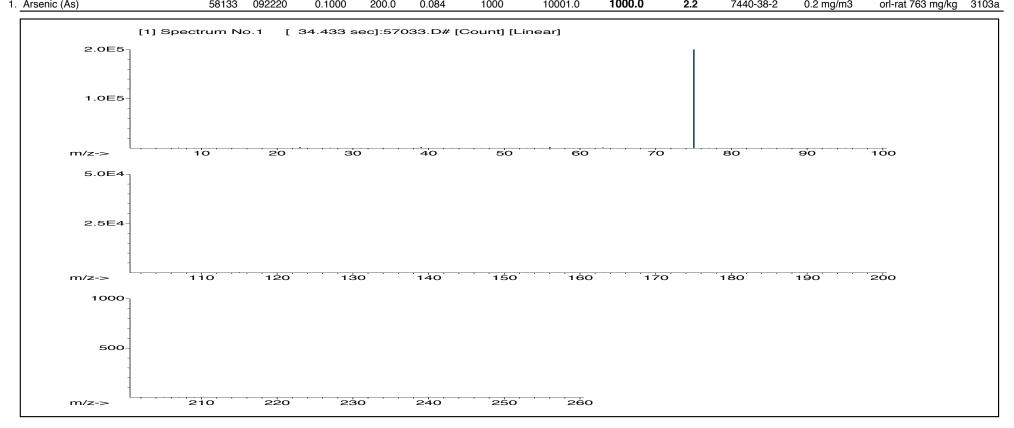
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By: Lawrence Barry 012521

Adds Reviewed By: Pedro L. Rentas 012521

**SDS Information** 

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





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

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

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

(T)= Target analyte

### Physical Characterization:

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

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

Certified by:

Bur P. Sha

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

19410105

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>57004</u>

Lot Number: 030221

Description: Beryllium (Be)

Part

Expiration Date: 030224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

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

Lot

Formulated By: Lawrence Barry 030221

Lawrence Barry 030221

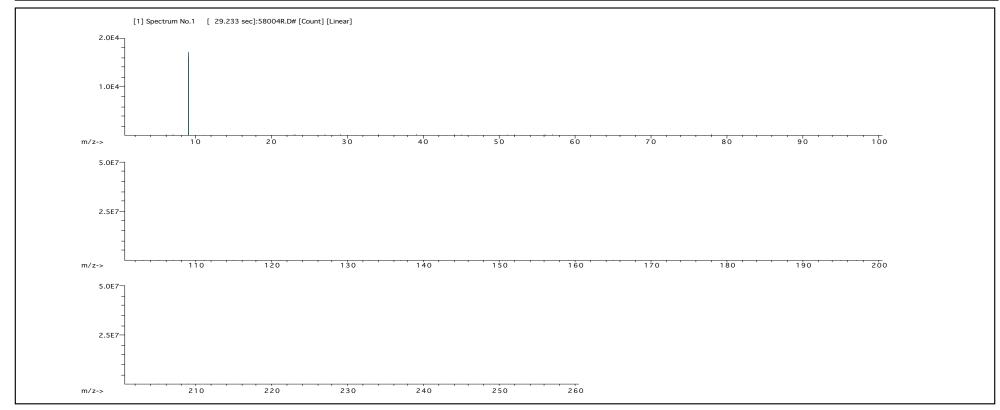
Reviewed By: Pedro L. Rentas 030221

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

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

Nominal





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

Bu P. Sha

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

20370011

2.0%



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

NIST

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

> Part Number: 57048 072821 Lot Number:

**Description:** Cadmium (Cd)

Part

**Expiration Date:** 072824

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

1000 Nominal Concentration (µg/mL):

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

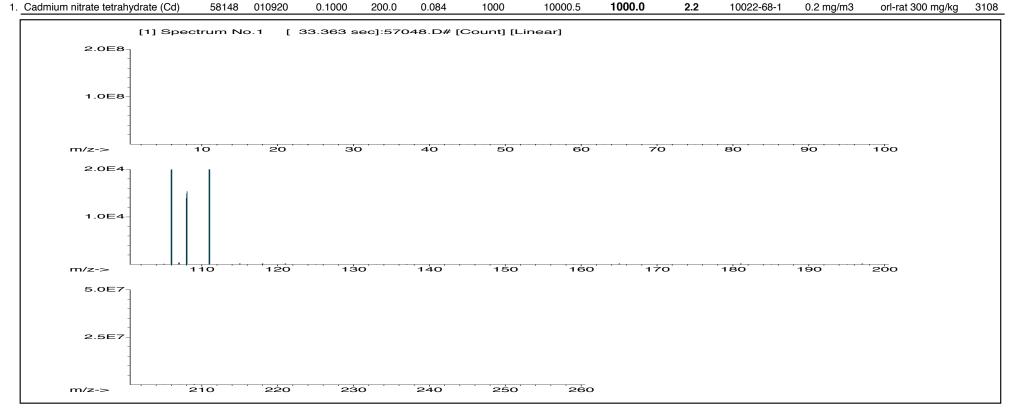
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

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

**SDS Information** 

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

Nominal





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

Bu P. All

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM



Expanded

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

CERTIFIED WEIGHT REPORT: Lot #

Part Number: 58111 Solvent: 20370011 Nitric Acid

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

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

Recommended Storage: Ambient (20 °C)

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

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

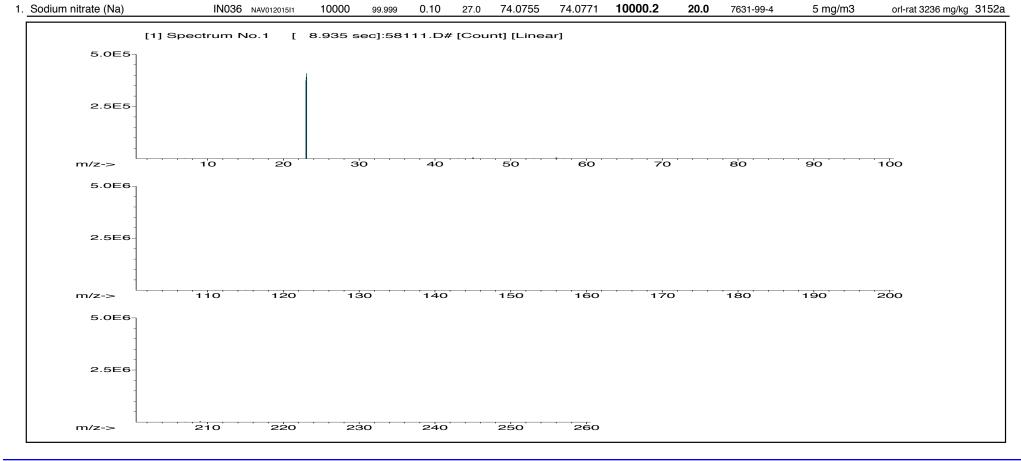
Weight shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By: Gabriel Helland 061421

Service Reviewed By: Pedro L. Rentas 061421

**SDS Information** 

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





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

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

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

(T)= Target analyte

### **Physical Characterization:**

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

Certified by:

Bu f. She

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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

NIST

<u>CERTIFIED WEIGHT REPORT:</u>

Lot # Solvent:

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

Description: Phosphorous (P)

Expiration Date: 051124

Part

Recommended Storage: Ambient (20 °C)

Nominal Concentration (μg/mL): 1000

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

Dilution

Initial

Uncertainty

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

Lot

Formulated By: Lawrence Barry 051121

Lawrence Barry 051121

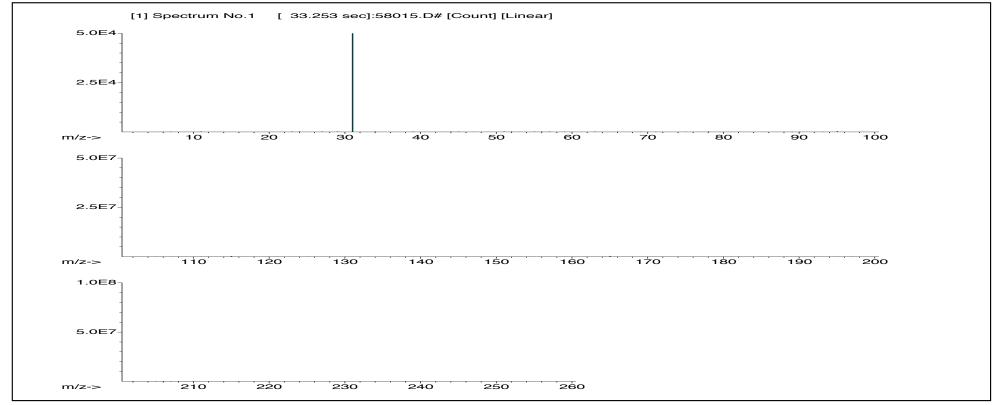
Reviewed By: Pedro L. Rentas 051121

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

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

Nominal





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

Bu R. All

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

20370011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57082

 Lot Number:
 062221

Description: Lead (Pb)

**Expiration Date:** 062224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

Formulated By: Lawrence Barry 062221

Lawrence Barry 062221

Reviewed By: Pedro L. Rentas 062221

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

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



Certified by:

Bur P. All

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

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

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

(T)= Target analyte

### **Physical Characterization:**

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

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

5.0E8

2.5E8

m/z->

210

220

230

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

ASTM Type 1 Water

051721



Expanded

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

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

> Part Number: 57016 Lot Number:

051721 **Description:** Sulfur (S)

**Expiration Date:** 051724

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

Nominal Concentration (µg/mL): 1000

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

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

**SDS Information** 

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

250

260

240



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

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

Bu f. All

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57034

 Lot Number:
 070221

Description: Selenium (Se)

**Expiration Date:** 070224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

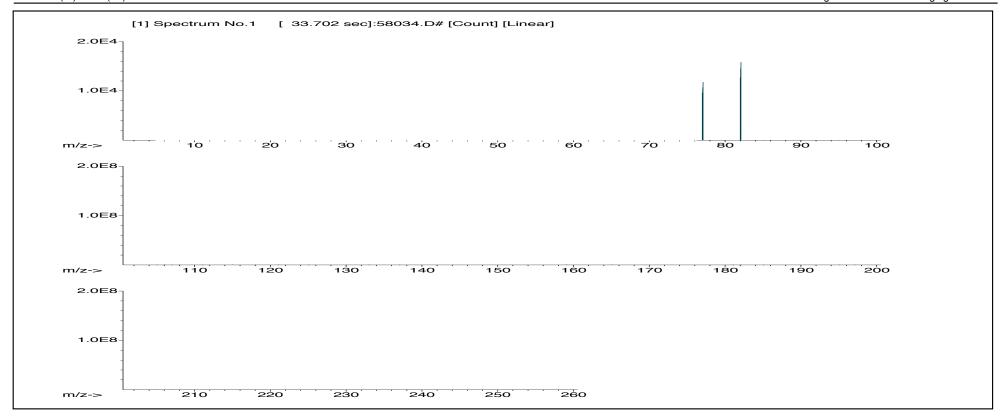
Formulated By: Giovanni Esposito 070221

Lector Denta 070221

Reviewed By: Pedro L. Rentas 070221

**SDS Information** 

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





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

Bu P. She

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

19410105

2.0%

Nitric Acid

Nitric Acid



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

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

> Part Number: 57014 030921 Lot Number:

Description: Silicon (Si)

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

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

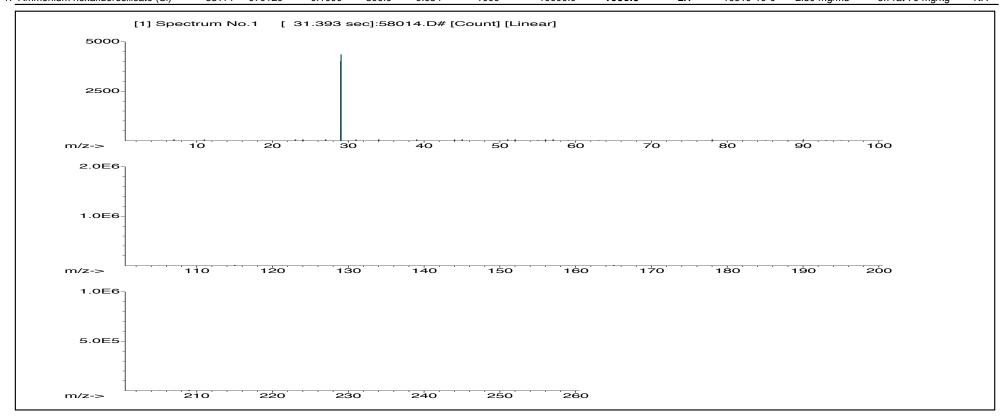
Nominal Concentration (µg/mL): 1000

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

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

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

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





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

Bu P. All

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

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

> Part Number: 57047 Lot Number: 072921

**Description:** Silver (Ag)

**Expiration Date:** 072924

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

1000 Nominal Concentration (µg/mL):

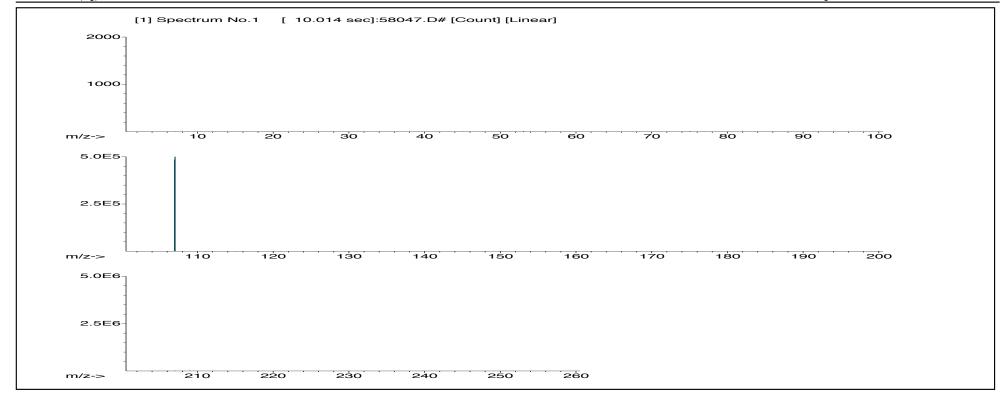
> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

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

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

**SDS Information** 

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





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

But All

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

800-368-1131 www.absolutestandards.com



Part

### Certified Reference Material CRM



Expanded

**SDS Information** 

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

NIST

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

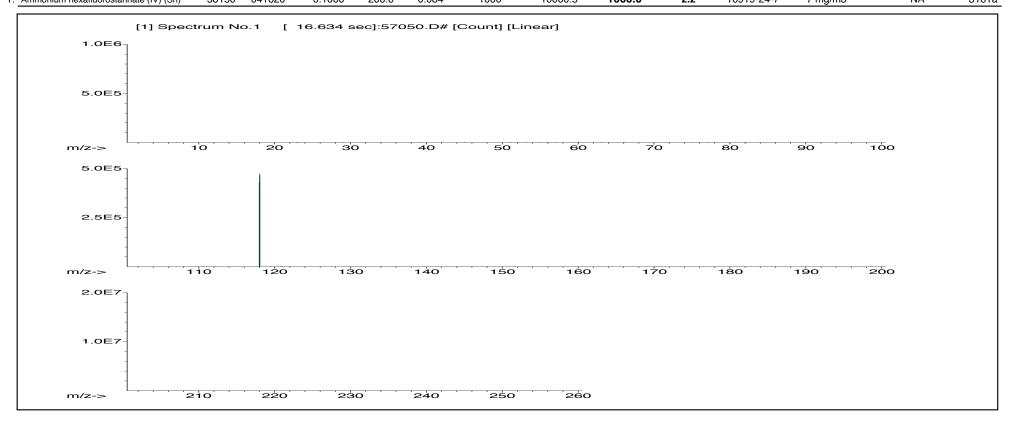
**Description:** Tin (Sn) 2.0% 40.0 Nitric Acid Formulated By: Lawrence Barry 021121 **Expiration Date:** 021124 6.0% 120.0 Hydrochloric acid **Recommended Storage:** Ambient (20 °C) (mL) 1000 Nominal Concentration (µg/mL): **NIST Test Number:** 23060 5E-05 Balance Uncertainty Reviewed By 021121 Pedro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

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

Initial

Final

Nominal





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

Bu f. All

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

20.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

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

> Part Number: 57038 062221 Lot Number:

**Description:** Strontium (Sr)

**Expiration Date:** 062224

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

Nominal Concentration (µg/mL): 1000

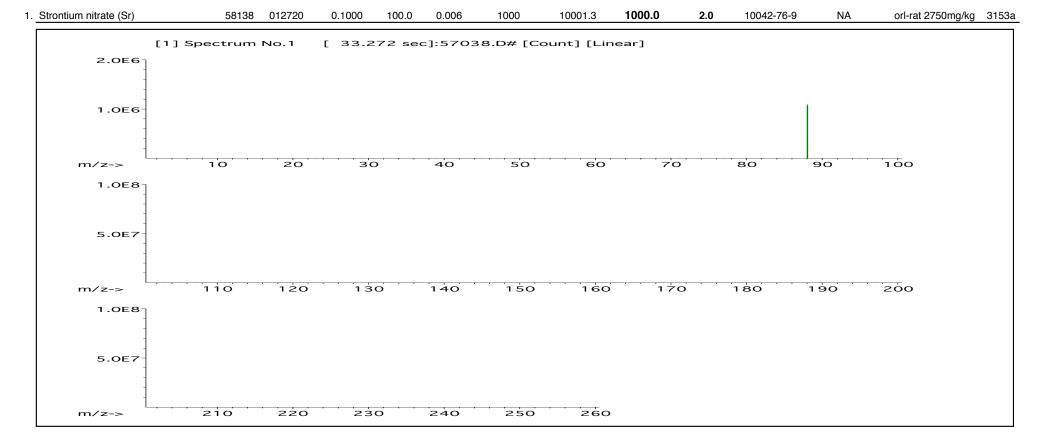
> **NIST Test Number: 6UTB** 5E-05 Balance Uncertainty

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

Formulated By: Lawrence Barry 062221 Reviewed By: Pedro L. Rentas 062221

**SDS Information** 

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





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

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

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

(T)= Target analyte

### Physical Characterization:

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

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

Certified by:

Bu P. All

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

20370011

Nitric Acid

40.0

(mL)

Nitric Acid



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57081

 Lot Number:
 073021

Description: Thallium (TI)

2.0% **Expiration Date:** 073024

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

Formulated By: Giovanni Esposito 073021

Reviewed By: Pedro L. Rentas 073021

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

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



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

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 58030

 Lot Number:
 031921

Description: Zinc (Zn)

Part

Expiration Date: 031924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

Dilution

Initial

Uncertainty

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

Lot

Formulated By: Giovanni Esposito 031921

Licks Kenta

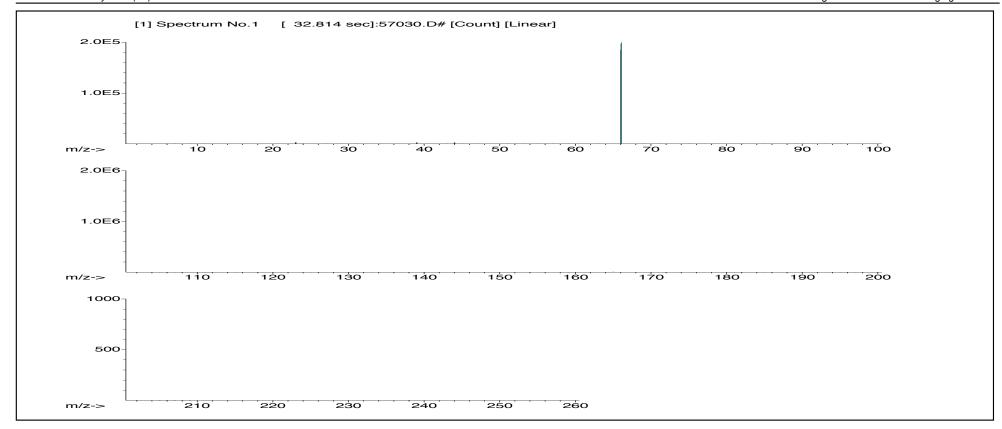
Reviewed By: Pedro L. Rentas 031921

**SDS Information** 

(Solvent Safety Info. On Attached pg.)

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

Nominal



### Certified Reference Material CRM



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

Bn f. Spla

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

### Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM



Expanded

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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: 57005 MKBQ8597V Ammonium hydroxide

Lot Number: 031921
Description: Boron (B)

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

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

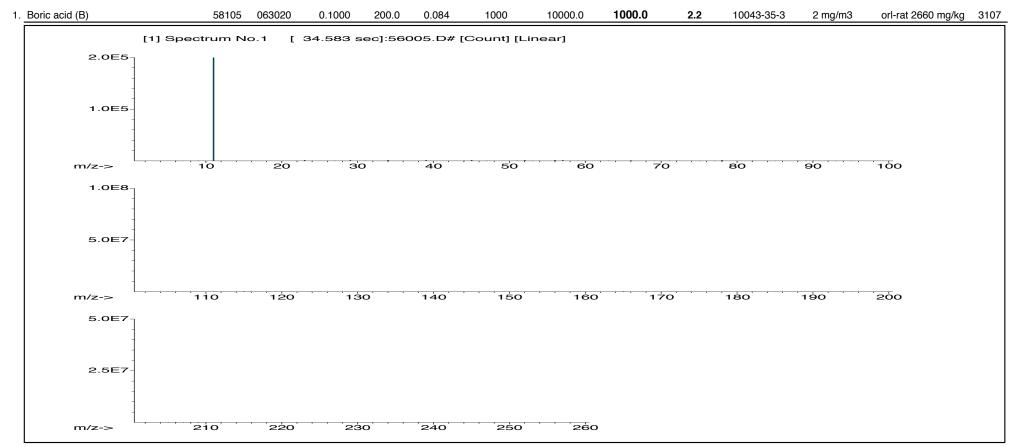
Formulated By: Giovanni Esposito 031921

Lista Henta

Reviewed By: Pedro L. Rentas 031921

**SDS Information** 

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



### Certified Reference Material CRM



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

Bu P. Sha

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

### Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



### Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 58029

 Lot Number:
 080321

Description: Copper (Cu)

Expiration Date: 080324

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

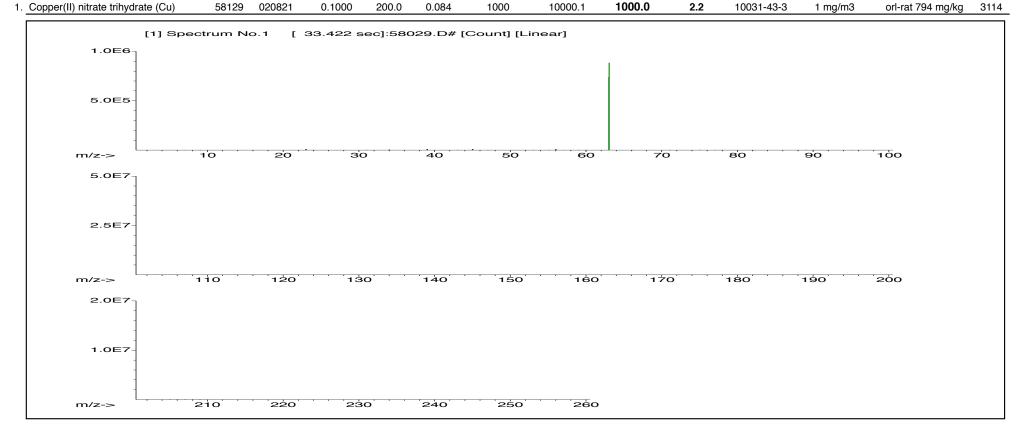
Formulated By: Lawrence Barry 080321

Lawrence Barry 080321

Reviewed By: Pedro L. Rentas 080321

**SDS Information** 

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



### Certified Reference Material CRM



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

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

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

(T)= Target analyte

### **Physical Characterization:**

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

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

Certified by:

Bu P. Sha



m/z-> 210	5.0E7	1.0E8 5.0E7	2.0E5	1. Lithium nitrate (Li)	Volume shown below was diluted to (mL):  Part Lot Compound Number Number	Recommended Storage: Nominal Concentration (ug/mL): NIST Test Number:	Part Number: Lot Number: Description:	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com
O		0	[ 32.093	58103	Part Number			
220		120	[ 32.093 sec]:58003.D# [Count] [Linear]	010320	Lot Number	Ambient (20 °C) 1000 23060	57003 030221 Lithium (Li)	
230		130	Ount] [Linear]	0.1000	2000.02 Dilution Factor	Ċ		
A some subsequence and the same of				200.0	0.058 Initial Vol. (mL)	5E-05		
240		140	0	0.084	0.058 Flask Uncertainty Initial Uncertainty Nominal Vol. (mL) Pipette (mL) Conc. (µg/mL)	Balance Uncertainty		ertified R
250		150	50	1000	Nominal Conc. (µg/mL)	winty	19410105 2.0%	eference
260		160	60		Initial Conc. (µg/mL) C	3	<b>光</b> 5	Certified Reference Material CRM $\mathbb{N}4^9$
				1000.0	Final Conc. (µg/mL)		Nitric Acid	Mc
		170	76		11	Reviewed By:	Formulated	P893
		180	80	7790-69-4	CAS	3	By:	
		190	90	5 mg/m3	SDS Information (Solvent Safety Info. On Attached pg.) # OSHA PEL (TWA) LD50	Pedro L. Rentas	Lawrence Barry	R:09/22/V
		200	100	ori-rat	ation Attached pg.) LD50	030221	030221	(B) https://absolutestandards.com
					NIST			occredited Number lards.com



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

As Ba Bi	As Ba	As Ba	As	r.	2	Αl		The same of the sa
<b>40.01</b>	70.02	20.02	000	40.2	<0.02	<0.02		
	င	Ω.	S	င့	ವಿ	Ω		
A).02	40.02	<0.02	<0.02	<0.02	40.2	<0.02		
Au	ဂ္ဂ	Ga	2	E	먁	Dу		Special property and party
200	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
В	4	F	F	ď	Но	Hf		
<0.02	<0.02	40.2	<0.02	<0.02	<0.02	<0.02	Trace M	
Nd	Мо	Нд	Mn	Mg	Ľ	Σ.	letals	
△0.02	<0.02	0.2	<0.02	10.0>	<0.02	Τ	Verifica	
*	72	P	Pd	S <sub>O</sub>	N <sub>P</sub>	Z.	tion l	
40.2	<0.02	<0.02	< 0.02	40.02	<0.02	€0.02	oy ICP-M	
Sc	Sm	Ru	Rb	R.	Re	Pr	in) S	
<0.02	<0.02	<0.02	<0.02	<0.02	< 0.02	<0.02	g/mL)	
Ta	S	Sr	Na	Ag	S:	Se		A CONTRACTOR OF THE PERSON NAMED IN
<0.02	<0.02	<0.02	40.2	<0.02	<0.02	40.2		
T	Sn	Tm	ħ	11	Te	41		
<0.02	<0.02	<0.02	<0.02	<0.02	< 0.02	<0.02		
Zr	Zn	Υ	4,	<	c	×		
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		

(T)= Target analyte

### Physical Characterization:

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

Certified by:

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

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

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

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

www.absolutestandards.com



## Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: Description:

58149

100721

Indium (In)

R: 10/08/

Lot #

Solvent: 20370011 Nitric Acid

Giovannie

reporter

5%

Nitric Acid

(III) 25.0

> Formulated By: Giovanni Esposito

> > 100721

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

10000

Ambient (20 °C)

Recommended Storage:

**Expiration Date:** 

100724

Weight shown below was diluted to (mL):

500.06

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

RM#

Number Lot

Nominal

Purity Uncertainty Assay

Target

Actual

Actual

Uncertainty

CAS#

Purity (%)

8

Reviewed By:

Expanded

100721

Pedro L. Rentas

SDS Information

NIST SRM

 Indium Oxide (In) IN086 W1096A Conc. (µg/mL) 10000 99.999 8 0.10 82.6 Weight (g) 6.05408 Weight (g) Conc. (µg/mL) 6.05441 10000.6 +/- (µg/mL) 20.1 1312-43-2 (Solvent Safety Info. On Attached pg.)

# OSHA PEL (TWA) LD50 Z 3124a

m/z->	2.5E6	5.0E6	m/z->	1.0E6	2.0E6	m/z->	2.5E7	5.0E7
2			110			10		
			120			N O		
			130			30		
240			140			4		
N D			150			50		
0			160			60		
			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		
Cr.	ರಿ ರ	S	င့	Ca	ß		
<0.02	<0.02	<0.02	<0.02	40.2	<0.02		
<u>≱</u>	ද ව	8	Eu	甲	Dy		
<0.02	<0.02 0.02	<0.02	<0.02	<0.02	<0.02		
P	L F	F	In	Но	Hf		
<0.02	40,02	<0.02	7	<0.02	<0.02	I acc ivid	Trace Ma
Z S	M <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	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).

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

www.absolutestandards.com



### Certified Reference Material CRM 180/08



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

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

2%

Nitric Acid

Formulated By:

Lawrence Barry

052521

<u>a</u> 40.0

Reviewed By:

Pedro L. Rentas

052521

Description: 052521 Yttrium (Y)

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

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

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

Yttrium (III) Oxide (Y)

IN087 YV012015B1

10000

99.999

0.10

77.9

25.6744

25.6745 10000.0

20.0

1314-36-9

¥

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

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

Part # 58139

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

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

## Physical Characterization:

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

Certified by:

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

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

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

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

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

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

Part # 58139

## Absolute Standards, Inc.

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:



## Certified Reference Material CRM

RA



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

011421 57116 Lot Number: Part Number:

Sulfur (S) Description:

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

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

5E-05 Balance Uncertainty

ASTM Type 1 Water

011421

Solvent:

Lot #

Lawrence Barry Or Formulated By:

011421

011421 Pedro L. Rentas Reviewed By:

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

Nominal

to Co

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

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

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

Lot # 011421 Part # 57116

260

250

240

230

220

210

m/z->

1.0E5

## Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

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

Physical Characterization:

(T)= Target analyte

Certified by:

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

\* 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).



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 57115 032921

Solvent: 20370011

Nitric Acid

Lot #

2%

Nitric Acid

Formulated By:

Lawrence Barry

032921

Laronce

(mL) 60.0

Description: Phosphorous (P)

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

NIST Test Number: **BTU9** 

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

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

NIST SRM 3186

	<ol> <li>Ammonium dihydrogen phosphate (P)</li> </ol>			Compound		
	IN008 PV052018A1		MAIN	BM#		
	V052018A1		1	Nimber	בטנ	2
	10000		Conc. (July 1111)	Cons (male)	Monningi	Nominal
	99.999		(9%)		Furity	0
	0.10		Punty (%)		Uncertainty Assay	
	27.3		(%)		ASSAY	•
	109.9063		Weight (g)		larget	•
The state of the last of the l	109.9093		Weight (g)		Actua	
	10000.3		) Conc. (ug/mL) +/- (ug/ml) CAS#		Actual	
	20.0		+/- (ua/ml	Contraction of	Incertainty	expanded
	20.0 7722-76-1	0, 1011	CAS#	(50)	(5)	
	5 ma/m3	(1417)	OSHA DEL (TWA)	(Solvent Salety line, on Attached bg.)	ant Cafatu lafo On Att	and information
CAL	NA	רויסט	1050	acried pg.)	nahad and	Í

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



		В	Bi	Ве	Ba	, ;	Ac	Sb	Α		-
		0.0	<0.02	0.0	<u></u>		4		90		
		_									
		S.	င္ပ	Ω	Cs	6	3		5		
		<0.02	40.02	<0.02	<0.02	20.02	6	3	<0.02		
		Au	င့	Ga	PO G	n	1 [	ŗ,	Dγ	New Spranger	
		<b>6</b> .02	40.02	40.02	<0.02	<0.02	20.02	3	40.02		
		3	<u></u>	균	ŀ	h	700	= ;	Hf		
	10000	40.00	A) ()2	02	<0.02	<0.02	20.02	200	20.00	1000	Trace
		£ ;	Mo d	¥	Mn	Mg	Lu	, <u>c</u>			Vetal.
$\overline{}$	1		Α,	<u> </u>		<u> </u>	Δ	-		100	\ \ \ \ \ \
(T)= Target analyte	70.	3 8	3 6	3	2	.01	.02	20.1	03	III Car	ifico+
jet ana	7	۲ ;	<b>D</b>	ָ ט	Pd	õ	B	2			5
lyte	7.05	20.02	3 -	3 8	<0.02	<0.02	<0.02	20.02		Jy ICT-I	N ICD N
	36	om om	î	7 8	Ş	R	Re	7		E C	2
	40.02	20.02	40.02	6.52	3	800	A).02	<0.02		9/111L)	2/21/
	Ta	0	, y	. 14	3 6	Ag	S:	Se			
	<b>€0.02</b>	40.02	40.02	102	3 2	3	40.02	602			
	Ti	Sn	Tm	In	1 :	1	F	ฮ	NAMED REPORTED		
	<0.02	<0.02	<0.02	20.02	20.02	3	40.02	<0.02	PARK BERKELLING SETTER		
	Zr	Zn	×	Υb		; ;	=	W			
	<0.02	<0.02	<0.02	<0.02	20.03	000	A) 03	<0.02	Mineral Landson		

## 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"

R! 04/20/21

Instructions for QATS Reference Material: Inorganic ICV Solutions

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

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

APPLICATION:

For use with 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

M5066

### (A) SAMPLE DESCRIPTION

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

### (B) BREAKAGE OR MISSING ITEMS

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

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

### (C) ANALYSIS OF SAMPLES

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

ICV1-1014

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

Page 1 of 2

RMs ICV 1, 5, 6 SFAM.docx

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





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

R:04/20/21

APTIM

### 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)  $K_2Cr_2O_7$  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

M5066

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

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



### CERTIFICATE OF ANALYSIS

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

Christiansburg, VA 24073 · USA inorganicventures.com

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: WW-LFS-1

 Lot Number:
 P2-MEB686379

 Matrix:
 5% (v/v) HNO3

Value / Analyte(s): 1 000 μg/mL ea:

Potassium, 600 µg/mL ea: Phosphorus, 300 µg/mL ea:

Sodium, Iron,

200 μg/mL ea:

Magnesium, Aluminum, Cerium,

Selenium, Thallium,

100 μg/mL ea:

Lead, Calcium,

80 μg/mL ea: Arsenic,

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

40 μg/mL ea: Chromium, 30 μg/mL ea:

Copper, Boron, Vanadium,

20 μg/mL ea:

Zinc,Strontium,Barium,Beryllium,Cadmium,Cobalt,

Manganese, Lithium,

7.5 µg/mL ea:

Silver

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Aluminum, Al	CERTIFIED VALUE 200.0 ± 0.7 μg/mL	ANALYTE Arsenic, As	CERTIFIED VALUE 80.0 ± 0.7 μg/mL
Barium, Ba	20.00 ± 0.09 μg/mL	Beryllium, Be	20.00 ± 0.09 μg/mL
Boron, B	30.00 ± 0.18 μg/mL	Cadmium, Cd	20.00 ± 0.09 μg/mL
Calcium, Ca	100.0 ± 0.4 μg/mL	Cerium, Ce	200.0 ± 0.8 μg/mL
Chromium, Cr	40.00 ± 0.23 μg/mL	Cobalt, Co	20.00 ± 0.09 μg/mL
Copper, Cu	30.00 ± 0.13 μg/mL	Iron, Fe	300.0 ± 1.2 μg/mL
Lead, Pb	100.0 ± 0.4 μg/mL	Lithium, Li	20.00 ± 0.09 μg/mL
Magnesium, Mg	200.0 ± 0.9 μg/mL	Manganese, Mn	20.00 ± 0.09 μg/mL
Mercury, Hg	70.0 ± 0.3 μg/mL	Nickel, Ni	49.99 ± 0.22 μg/mL
Phosphorus, P	600.0 ± 3.0 μg/mL	Potassium, K	1 000 ± 4 μg/mL
Selenium, Se	200.0 ± 1.6 μg/mL	Silver, Ag	7.50 ± 0.03 μg/mL
Sodium, Na	300.0 ± 1.2 μg/mL	Strontium, Sr	20.00 ± 0.09 μg/mL
Thallium, Tl	200.0 ± 1.3 μg/mL	Vanadium, V	30.00 ± 0.13 μg/mL
Zinc, Zn	20.00 ± 0.08 μg/mL		

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

**Assay Information:** 

<b>ANALYTE</b> Ag	METHOD ICP Assay	<b>NIST SRM#</b> 3151	<b>SRM LOT#</b> 160729
Ag	Volhard	999c	999c
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
В	ICP Assay	3107	110830
Ва	ICP Assay	3104a	140909
Ва	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
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Ce	ICP Assay	3110	090504
Ce	EDTA	928	928
Co	EDTA	928	928
Co	ICP Assay	traceable to 3113	M2-CO661665
Cr	ICP Assay	3112a	170630
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Cu	Calculated		See Sec. 4.2
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
Hg	ICP Assay	3133	061204
Hg	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Calculated		See Sec. 4.2
Li	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	EDTA	928	928
Mn	ICP Assay	Traceable to 3132	N2-MN665236
Mn	Calculated		See Sec. 4.2
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Р	ICP Assay	3139a	060717
Р	Acidimetric	84L	84L
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	ICP Assay	3149	100901
Sr	EDTA	928	928
Sr	ICP Assay	Traceable to 3153a	K2-SR650985
Sr	Calculated		See Sec. 4.2

TI	ICP Assay	3158	993012
V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

### 5.0 TRACE METALLIC IMPURITIES (TMI ) DETERMINED BY ICP-MS AND ICP-OES ( $\mu g/mL$ )

N/A

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 HOMOGENEITY

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

November 05, 2019

- 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 05, 2023
- 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 Open Date:</li> </ul>	
---	--

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

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

**Certificate Approved By:** 

Michael Booth Manager, Quality Control Michael 2 Booth

**Certifying Officer:** 

Paul Gaines CEO, Senior Technical Director



### CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030 fax: 540.585.3012

info@inorganicventures.com

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

### 1.0 ACCREDITATION / REGISTRATION

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



### 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: WW-LFS-2

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

tr. HF

Value / Analyte(s): 200 µg/mL ea:

Silica,

80 μg/mL ea: Antimony, 70 μg/mL ea:

Tin,

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

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE CERTIFIED VALUE ANALYTE CERTIFIED VALUE Antimony, Sb 80.0  $\pm$  0.6  $\mu$ g/mL Molybdenum, Mo 40.00  $\pm$  0.17  $\mu$ g/mL Silica, SiO2 200.0  $\pm$  1.5  $\mu$ g/mL Tin, Sn 70.0  $\pm$  0.3  $\mu$ g/mL

Titanium, Ti 20.00 ± 0.12 μg/mL

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

### Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Мо	ICP Assay	3134	130418
Mo	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
SiO2	Calculated		See Sec. 4.2
Sn	ICP Assay	3161a	070330
Ti	ICP Assay	3162a	130925
Ti	Calculated		See Sec. 4.2

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

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

### 4.0 TRACEABILITY TO NIST

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

### 4.1 Thermometer Calibration

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

### 4.2 Balance Calibration

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

### 4.3 Glassware Calibration

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

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

N/A

### 6.0 INTENDED USE

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

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

### 7.1 Storage and Handling Recommendations

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

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

### 8.0 HAZARDOUS INFORMATION

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

### 9.0 **HOMOGENEITY**

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

### 10.0 QUALITY STANDARD DOCUMENTATION

### 10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

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

### 11.1 Certification Issue Date

May 20, 2020

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

### 11.2 Lot Expiration Date

- May 20, 2024
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRWRM can be supported by long term stability studies conducted on properly stored and handled CRWRMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

### 11.3 Period of Validity

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

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

Michael 2 Booth

### 12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

### Certificate Approved By:

Michael Booth Manager, Quality Control

### **Certifying Officer:**

Paul Gaines

Paul R & ine CEO, Senior Technical Director



58112

022825

Lot

Nominal

MISILO



**Expanded** 

Uncertainty

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

NIST

800-368-1131 www.absolutestandards.com CERTIFIED WEIGHT REPORT:

**Part Number:** 

Lot#

Solvent: 20370011 Nitric Acid

**Lot Number:** 022822 Description:

Magnesium (Mg)

40.0 Nitric Acid

(mL)

Target

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

**Expiration Date:** 

10000

**NIST Test Number: 6UTB** 

5E-05 Balance Uncertainty

Uncertainty Assay

Purity

Weight shown below was diluted to (mL): 2000.02

0.058 Flask Uncertainty

Actual

Actual

Formulated By: Lawrence Barry 022822 Reviewed By: Pedro L. Rentas 022822

**SDS Information** 

(Solvent Safety Info. On Attached pg.) Compound Number Conc. (µg/mL) (%) Purity (96) Weight (g) Conc. (µg/mL) +/- (µg/mL) (%) Weight (g) CAS# **OSHA PEL (TWA)** SRM LD50 1. Magnesium nitrate hexahydrate (Mg) IN030 MGM052021A1 10000 99.999 0.10 9.40 212.7701 212.7718 10000.1 20.0 13446-18-9 NA orl-rat 5440 mg/kg 3131a [1] Spectrum No.1 [ 19.923 sec]:58112.D# [Count] [Linear] 1.0E6 5.0E5 m/z-> 10 20 30 40 50 60 70 80 90 100 2000 1000 m/z-> 110 120 130 140 150 160 170 180 190 200 2.0E4 1.0E4 m/z->210 220 230 240 250 260





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

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

		ing from which there is				,	Trace M	etals	Verifica	rtion	by ICP-M	IS (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	l li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Тъ	am.	l w	000
Sb	<0.02	Ca	<0.2	Er	<0.02	Но	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<b>₹0.02</b>	Te	<0.02 <0.02	W	<0.02 <0.02
As	<0.2	Ce	<0.02	Eu	<0.02	ln	<0.02	Mg	T	Os	<0.02	Rh	<0.02	Ag	<0.02	Ti	<0.02	v	<0.02
Ba	<0.02	Cs	<0.02	Gd	<0.02	lr	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	P	< 0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	< 0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02

(T) =Target analyte

Physical Characterization:

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

Certified by:

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

V, and Zn. This instruction sheet provides the nominal let analytes when diluted as directions. 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 INTER	REFERENCE	CHECK	SAMPLE	ICP-AES	ICSA-1211,
		AND IC	CSA-1211 N	<b>WIXED WITH</b>	HICSB-0	710		

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	250000	210000	290000	250000	210000	290000
Sb	60	(0.0)	-60	60	620	530	710
As	10	(0.0)	-10	10	100	85	120
Ва	200	(6.0)	-190	210	(540)	340	740
Be	5.0	(0.0)	-5.0	5.0	500	430	580
Cd	5.0	(1.0)	-4.0	6.0	970	820	1100
Ca	5000	240000	200000	280000	230000	200000	260000
Cr	. 10	(52)	42	62	540	460	620
Со	50	(0.0)	-50	50	480	410	550
Cu	25 *	(2.0)	-23	27	510	430	590
Fe	100	100000	85000	120000	99000	84000	110000
Pb	10	(0.0)	-10	10	(49)	39	59
Mg	5000	260000	220000	300000	250000	210000	290000
Mn	15	(7.0)	-8.0	22	510	430	590
Ni	40	(2.0)	-38	42	950	810	1100
Se	35	(0.0)	-35	35	(46)	11	81
Ag	10	(0.0)	-10	10	200	170	230
TI	25	(0.0)	-25	25	(110)	85	140
V	50	(0.0)	-50	50	490	420	560
Zn	60	(0.0)	-60	60	950	810	1100

The acceptance ranges for all analytes in parentheses in the above table were determined using the listed certified value ± 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.

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

Hydrochloric Acid, 36.5-38.0% BAKER INSTRA-ANALYZED® Reagent

For Trace Metal Analysis



Material No.: 9530-33 Batch No.: 0000275677

Manufactured Date: 2020/12/16 Retest Date: 2025/12/15

Revision No: 1

### Certificate of Analysis

Test	Specification	Result
ACS - Assay (as HCl) (by acid-base titrn)	36.5 - 38.0 %	37.6
ACS – Color (APHA)	<= 10	5
ACS – Residue after Ignition	<= 3 ppm	1
ACS – Specific Gravity at 60°/60°F	1.185 - 1.192	1.190
ACS – Bromide (Br)	<= 0.005 %	< 0.005
ACS – Extractable Organic Substances	<= 5 ppm	1
ACS – Free Chlorine (as Cl <sub>2</sub> )	<= 0.5 ppm	< 0.5
Phosphate (PO4)	<= 0.05 ppm	< 0.03
Sulfate (SO <sub>4</sub> )	<= 0.5 ppm	< 0.3
Sulfite (SO₃)	<= 0.8 ppm	0.3
Ammonium (NH4)	<= 3 ppm	< 1
Trace Impurities – Arsenic (As)	<= 0.010 ppm	< 0.003
Trace Impurities – Aluminum (Al)	<= 10.0 ppb	< 0.2
Arsenic and Antimony (as As)	<= 5 ppb	< 3
Frace Impurities – Barium (Ba)	<= 1.0 ppb	< 0.2
Trace Impurities – Beryllium (Be)	<= 1.0 ppb	< 0.2
Trace Impurities – Bismuth (Bi)	<= 10.0 ppb	< 1.0
Frace Impurities – Boron (B)	<= 20.0 ppb	< 5.0
Trace Impurities - Cadmium (Cd)	<= 1.0 ppb	< 0.3
Frace Impurities – Calcium (Ca)	<= 50.0 ppb	29.7
Trace Impurities – Chromium (Cr)	<= 1.0 ppb	< 0.4
Frace Impurities – Cobalt (Co)	<= 1.0 ppb	< 0.3
Frace Impurities – Copper (Cu)	<= 1.0 ppb	< 0.1
Trace Impurities – Gallium (Ga)	<= 1.0 ppb	< 0.2

Material No.: 9530-33 Batch No.: 0000275677

Test	Specification	Result
Trace Impurities - Germanium (Ge)	<= 3.0 ppb	< 2.0
Trace Impurities - Gold (Au)	<= 4.0 ppb	< 0.2
Heavy Metals (as Pb)	<= 100 ppb	< 50
Trace Impurities – Iron (Fe)	<= 15.0 ppb	<1
Trace Impurities – Lead (Pb)	<= 1.0 ppb	< 0.5
Trace Impurities - Lithium (Li)	<= 1.0 ppb	0.2
Trace Impurities - Magnesium (Mg)	<= 10.0 ppb	0.4
Trace Impurities - Manganese (Mn)	<= 1.0 ppb	< 0.4
Trace Impurities - Mercury (Hg)	<= 0.5 ppb	0.1
Trace Impurities - Molybdenum (Mo)	<= 10.0 ppb	< 5.0
Trace Impurities - Nickel (Ni)	<= 4.0 ppb	< 0.3
Trace Impurities - Niobium (Nb)	<= 1.0 ppb	< 0.2
Trace Impurities – Potassium (K)	<= 9.0 ppb	< 2.0
Trace Impurities - Selenium (Se), For Information Only	ppb	1.0
Trace Impurities – Silicon (Si)	<= 100.0 ppb	< 10.0
Trace Impurities - Silver (Ag)	<= 1.0 ppb	< 0.3
Trace Impurities - Sodium (Na)	<= 100.0 ppb	< 5.0
Trace Impurities - Strontium (Sr)	<= 1.0 ppb	< 0.2
Trace Impurities - Tantalum (Ta)	<= 1.0 ppb	< 0.9
Trace Impurities - Thallium (TI)	<= 5.0 ppb	< 2.0
Trace Impurities - Tin (Sn)	<= 5.0 ppb	< 0.8
Trace Impurities - Titanium (Ti)	<= 1.0 ppb	0.2
Trace Impurities - Vanadium (V)	<= 1.0 ppb	< 0.2
Trace Impurities – Zinc (Zn)	<= 5.0 ppb	0.3
Trace Impurities – Zirconium (Zr)	<= 1.0 ppb	< 0.1

For Laboratory, Research or Manufacturing Use Product Information (not specifications): Appearance (clear, fuming liquid) Meets ACS Specifications

Country of Origin: US

Packaging Site: Phillipsburg Mfg Ctr & DC







M 5154, M 5155, M 5156, M 5157, M 5158, M 5159, Material No.: 9606-03

Batch No.: 22B0862001

Manufactured Date: 2022-01-28

Retest Date: 2027-01-27

Revision No.: 0

### Certificate of Analysis

Test	Specification	Result
Assay (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 (AI)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.5 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	2.3 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb





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

Test	Specification	Result
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb
Trace Impurities - Potassium (K)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb
Particle Count - 0.5 $\mu m$ and greater	≤ 60 par/ml	4 par/ml
Particle Count - 1.0 $\mu m$ and greater	≤ 10 par/ml	1 par/ml

Nitric Acid CMOS





Material No.: 9606-03

Batch No.: 22B0862001

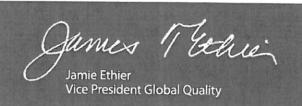
Test

Specification

Result

For Microelectronic Use Country of Origin: USA

Packaging Site: Phillipsburg Mfg Ctr & DC



Nitric Acid CMOS

### R! 04/19/22 avantor



M5166, M5167, M5168, M5169 M5170, M5171 Mai

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

Manufactured Date: 2022-01-28

Retest Date: 2027-01-27

Revision No.: 0

### Certificate of Analysis

Test	Specification	Result
Assay (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 (AI)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	1.5 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	2.3 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb





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

Test	Specification	Result	
Trace Impurities - Niobium (Nb)	≤ 50.0 ppb	< 1.0 ppb	
Trace Impurities - Potassium (K)	≤ 50 ppb	< 10 ppb	
Trace Impurities - Silicon (Si)	≤ 50 ppb	< 10 ppb	
Trace Impurities - Silver (Ag)	≤ 20.0 ppb	< 1.0 ppb	
Trace Impurities - Sodium (Na)	≤ 150.0 ppb	< 5.0 ppb	
Trace Impurities - Strontium (Sr)	≤ 30.0 ppb	< 1.0 ppb	
Trace Impurities - Tantalum (Ta)	≤ 10.0 ppb	< 5.0 ppb	
Trace Impurities - Thallium (TI)	≤ 10.0 ppb	< 5.0 ppb	
Trace Impurities - Tin (Sn)	≤ 20.0 ppb	< 10.0 ppb	
Trace Impurities - Titanium (Ti)	≤ 10.0 ppb	< 1.0 ppb	
Trace Impurities - Vanadium (V)	≤ 10.0 ppb	. < 1.0 ppb	
Trace Impurities - Zinc (Zn)	≤ 20.0 ppb	< 1.0 ppb	
Trace Impurities - Zirconium (Zr)	≤ 10.0 ppb	< 1.0 ppb	
Particle Count - 0.5 $\mu m$ and greater	≤ 60 par/ml	4 par/ml	
Particle Count - 1.0 $\mu m$ and greater	≤ 10 par/ml	1 par/ml	

Nitric Acid CMOS





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

Test

Specification

Result

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

