

Prep Standard - Chemical Standard Summary

Order ID: 01233

Test: Mercury, Metals ICP-TAL

Prepbatch ID: PB150370,PB150382,

Sequence ID/Qc Batch ID: LB123754,LB123763,LB123785,

Standard ID:

MP73163,MP73178,MP73188,MP73191,MP73192,MP73193,MP73235,MP73236,MP73253,MP73254,MP73255,MP73256,MP73257,MP73258,MP73259,MP73260,MP73261,MP73262,MP73263,MP73406,MP73407,MP73408,MP73409,MP73410,MP73411,MP73412,MP73413,MP73414,MP73415,MP73416,MP73417,MP73418,MP73419,MP73420,MP73437,MP73473,MP73474,MP73475,MP73476,MP73477,MP73478,MP73479,MP73480,MP73481,MP73482,MP73483,MP73484,MP73485,

Chemical ID:

M4371,M4459,M4583,M4589,M4657,M4768,M4794,M4825,M4844,M4874,M4876,M4877,M4878,M4880,M4881,M4882, M4883,M4884,M4885,M4886,M4888,M4889,M4891,M4894,M4901,M4902,M4916,M4920,M4939,M4960,M4961,M5019, M5020,M5062,M5100,M5108,M5127,M5184,M5193,M5200,M5201,M5218,M5220,M5224,M5226,M5227,M5228,M5285, M5289,M5290,M5291,M5317,M5322,M5387,M5393,M5394,M5408,M5412,M5414,M5416,M5418,M5422,M5425,W2606,

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Metals STANDARD PREPARATION LOG

Recipe ID 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	NO. MP73163	Prep Date 01/02/2023	Expiration Date 02/28/2023	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/03/2023
FROM	125.00000ml of M5408 + 2350.0000	oml of W260	06 + 25.00000	ml of M5412 =	Final Quantity:	2500.000 ml		

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
169			01/04/2023		Al-Terek Isaac		METALS PIP	Sarabjit Jaswal
							ETTE_1 (ICP	01/05/2023

FROM 1250.00000ml of M5412 + 1250.00000ml of W2606 = Final Quantity: 2500.000 ml

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Metals STANDARD PREPARATION LOG

Reci		<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal		
919	9	ICP AES INTERNAL STD	MP73188	01/03/2023	02/28/2023	Bin He	None	METALS_PIP ETTE_3 (A)	01/05/2023		

FROM 1.00000ml of M4961 + 10.00000ml of M4960 + 1969.00000ml of W2606 + 20.00000ml of M5412 = Final Quantity: 2000.000 ml

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
912	ICP AES ICV SOLN	MP73191	01/04/2023	01/22/2023	Bin He	None	None	-
								01/05/2023

FROM 0.02500ml of M5019 + 0.02500ml of M5020 + 0.02500ml of M5228 + 0.25000ml of M5218 + 10.00000ml of M5291 + 89.67500ml of MP73163 = Final Quantity: 100.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabiit Jaswal
2950	ICP AES S1/CRI STOCK STD	MP73192	01/04/2023	02/28/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

FROM

 $0.03000ml\ of\ M4876+0.03000ml\ of\ M4877+0.05000ml\ of\ M4657+0.05000ml\ of\ M4885+0.05000ml\ of\ M4894+0.05000ml\ of\ M5289+0.06000ml\ of\ M4881+0.10000ml\ of\ M4874+0.10000ml\ of\ M4880+0.10000ml\ of\ M4883+0.10000ml\ of\ M4902+0.10000ml\ of\ M4939+0.10000ml\ of\ M5184+0.10000ml\ of\ M5228+0.15000ml\ of\ M4825+0.20000ml\ of\ M4768+0.20000ml\ of\ M4886+0.20000ml\ of\ M4888+0.20000ml\ of\ M4889+0.20000ml\ of\ M4891+0.20000ml\ of\ M5227+0.25000ml\ of\ M5224+0.50000ml\ of\ M4901+0.50000ml\ of\ M5387+1.00000ml\ of\ M4878+1.00000ml\ of\ M5108+1.00000ml\ of\ M5200+1.00000ml\ of\ M5201+1.00000ml\ of\ M5290+2.00000ml\ of\ M4882+2.00000ml\ of\ M4884+87.38000ml\ of\ MP73163\ =\ Final\ Quantity: 100.000\ ml$

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By
2951	ICP AES S1/CRI WORK STD	<u> </u>	01/04/2023		Bin He	None	METALS_PIP ETTE_3 (A)	

FROM 196.00000ml of MP73163 + 4.00000ml of MP73192 = Final Quantity: 200.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
65	POTASSIUM PERMANGANATE SOLUTION 5 %	MP73235	01/06/2023	07/06/2023		METALS_SCA LE_3 (M SC-3)		01/06/2023
FROM	100.00000gram of M4916 + 2000.00	000ml of W2	2606 = Final	Quantity: 2000.	000 ml			

FROM	100.00000gram of M4916 + 2000.00000ml of W2606 = Final Quantity: 2000.000 ml
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Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
67	SODIUM CHLORIDE - HYDROXYL- CHLORIDE SOLUTION	MP73236	01/06/2023	07/06/2023		METALS_SCA LE_3 (M SC-3)		01/06/2023

FROM 2000.0000ml of W2606 + 240.00000gram of M4371 + 240.00000gram of M4459 = Final Quantity: 2000.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	NO. MP73253	Prep Date 01/09/2023	Expiration Date 01/22/2023	Prepared By Bin He	ScaleID None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/11/2023
FROM	125.00000ml of M5416 + 2350.00000	Oml of W260	06 + 25.00000	ml of M5414 =	Final Quantity:	2500.000 ml	<u> </u>	

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	PipettelD	Supervised By
903			01/09/2023	01/22/2023	Bin He		METALS_PIP ETTE_3 (A)	

FROM 200.0000ml of M5414 + 9800.0000ml of W2606 = Final Quantity: 10000.000 ml

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Metals STANDARD PREPARATION LOG

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
904	ICP AES ICSA SOLN	MP73255	01/09/2023	01/22/2023	Bin He	None	METALS_PIP	
							ETTE_3 (A)	01/11/2023
FROM	10.00000ml of M5127 + 90.00000ml	of MP73253	3 = Final Qua	ntity: 100.000	ml			

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
3494	ICP AES ICSAB SOLN-1	MP73256	01/09/2023	01/22/2023	Bin He	None	METALS_PIP ETTE_3 (A)	

FROM 0.10000ml of M4589 + 0.10000ml of M4880 + 0.10000ml of M4882 + 0.10000ml of M4939 + 0.10000ml of M5228 + 10.00000ml of M5127 + 10.00000ml of M5220 + 79.50000ml of MP73253 = Final Quantity: 100.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID 907	NAME ICP AES STD S (S5)	NO. MP73257	Prep Date 01/09/2023	Expiration Date 01/22/2023	Prepared By Bin He	ScaleID None	PipettelD METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/11/2023	
FROM 5.00000ml of M4589 + 5.00000ml of M4880 + 5.00000ml of M4882 + 5.00000ml of M4939 + 5.00000ml of M5100 + 5.00000ml									

of M5224 + 5.00000ml of M5228 + 5.00000ml of M5394 + 460.00000ml of MP73253 = Final Quantity: 500.000 ml

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	PipetteID	Supervised By
910	ICP AES STD S4		01/09/2023	01/22/2023	Bin He	None	METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/11/2023

FROM 100.00000ml of MP73253 + 100.00000ml of MP73257 = Final Quantity: 200.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID 909	NAME ICP AES STD S3	NO. MP73259	Prep Date 01/09/2023	Expiration Date 01/22/2023	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/11/2023
FROM	150.00000ml of MP73253 + 50.0000	Oml of MP7	3257 = Final (Quantity: 200.0	00 ml			

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
3913	ICP AES STD S2		01/09/2023	01/22/2023	Bin He	None	METALS_PIP ETTE_3 (A)	Sarabjit Jaswal

FROM 16.00000ml of MP73257 + 184.00000ml of MP73253 = Final Quantity: 200.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal	
911	ICP AES CCV SOLN	MP73261	01/09/2023	01/22/2023	Bin He	None	METALS_PIP ETTE_3 (A)	01/11/2023	
FROM 100.00000ml of MP73253 + 100.00000ml of MP73257 = Final Quantity: 200.000 ml									

<u>FROM</u>	100.00000ml of MP/3253 +	100.00000ml of MP/325/	= Final Quantity: 200.000 mi

Recipe ID	<u>NAME</u>	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3651	LR CHECK 1	MP73262	01/09/2023	01/22/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

10.00000ml of M5201 + 18.00000ml of M5108 + 18.00000ml of M5200 + 18.00000ml of M5290 + 20.00000ml of M5289 + **FROM** 9.00000ml of M4894 + 7.00000ml of MP73253 = Final Quantity: 100.000 ml

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Metals STANDARD PREPARATION LOG

	Recipe <u>ID</u> 3652	NAME LR CHECK2	NO. MP73263	Prep Date 01/09/2023	Expiration Date 01/22/2023	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/11/2023
FROM 10.00000ml of M5387 + 2.50000ml of M4844 + 25.00000ml of M5226 + 3.50000ml of M4891 + 4.50000ml of M5184 + 5.00000ml of M4768 + 54.50000ml of MP73253 = Final Quantity: 100.000 ml									

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
902	ICP AES CAL BLK (SO/ICB/CCB)	MP73406	01/19/2023	01/25/2023	Bin He	None	METALS_PIP ETTE_3 (A)	•

FROM 125.00000ml of M5418 + 2350.00000ml of W2606 + 25.00000ml of M5425 = Final Quantity: 2500.000 ml

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Recipe ID	NAME_	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
871	MERCURY INTERMEDIATE B 250PPB WORKING STD.	MP73407	01/20/2023	01/21/2023	Mohan Bera	None	None	01/20/2023
FROM	1.00000ml of M5425 + 2.50000ml of	M5062 + 96	3.50000ml of V	V2606 = Final	Quantity: 100.0	00 ml		

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipettelD	Supervised By
1340	Hg 0.00 PPB STD		01/20/2023	01/21/2023	Mohan Bera	None	None	Sarabjit Jaswal
								01/20/2023

FROM 2.50000ml of M5425 + 247.50000ml of W2606 = Final Quantity: 250.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal		
1341	Hg 0.2 PPB STD	MP73409	01/20/2023	01/21/2023	Mohan Bera	None	None	,		
								01/20/2023		
FROM	FROM 2.50000ml of M5425 + 247.30000ml of W2606 + 0.20000ml of MP73407 = Final Quantity: 250.000 ml									

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
1342	Hg 2.5 PPB STD	MP73410	01/20/2023	01/21/2023	Mohan Bera	None	None	01/20/2023

FROM 2.50000ml of M5425 + 245.00000ml of W2606 + 2.50000ml of MP73407 = Final Quantity: 250.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID 1343	NAME Hg 5.0 PPB STD	NO.	Prep Date 01/20/2023		Prepared By Mohan Bera	<u>ScaleID</u> None	<u>PipettelD</u> None	Supervised By Sarabjit Jaswal		
10.10	119 0.0 1 1 2 0 1 2	<u> </u>	0 1/20/2020	0 1/2 1/2020	Worldin Bord	110110	110110	01/20/2023		
FROM	FROM 2.50000ml of M5425 + 242.50000ml of W2606 + 5.00000ml of MP73407 = Final Quantity: 250.000 ml									

Recipe	NAME	NO	Dron Data	Expiration	<u>Prepared</u>	SaalalD	DinettelD	Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date		<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1344	Hg 7.5 PPB STD	<u>MP73412</u>	01/20/2023	01/21/2023	Mohan Bera	None	None	01/20/2023

FROM 2.50000ml of M5425 + 240.00000ml of W2606 + 7.50000ml of MP73407 = Final Quantity: 250.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal		
1345	Hg 10.0 PPB STD	MP73413	01/20/2023	01/21/2023	Mohan Bera	None	None			
								01/20/2023		
FROM	FROM 2.50000ml of M5425 + 237.50000ml of W2606 + 10.00000ml of MP73407 = Final Quantity: 250.000 ml									

1 1 1 0 111	 	

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	<u>NAME</u>	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1346	Hg ICV SOLUTION	MP73414	01/20/2023	01/21/2023	Mohan Bera	None	None	-
								01/20/2023

FROM 2.50000ml of M4794 + 2.50000ml of M5425 + 245.00000ml of W2606 = Final Quantity: 250.000 ml

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Metals STANDARD PREPARATION LOG

Recipe <u>ID</u> 1351	NAME ICB (Hg 0.00 PPB SOLUTION)	NO. MP73415	Prep Date 01/20/2023	Expiration Date 01/21/2023	Prepared By Mohan Bera	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_5 (HG	
FROM	2.50000ml of M5425 + 247.50000ml	of W2606 =	Final Quanti	ty: 250.000 ml			' A)	

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
1358	CCV (Hg 5.0 PPB SOLUTION)	MP73416	01/20/2023	01/21/2023	Mohan Bera	None	METALS_PIP	,
							ETTE_5 (HG	01/20/2023
							A)	

FROM 485.00000ml of W2606 + 5.00000ml of M5425 + 10.00000ml of MP73407 = Final Quantity: 500.000 ml

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Metals STANDARD PREPARATION LOG

Recipe <u>ID</u> 1352	NAME CCB (Hg 0.00 PPB SOLUTION)	NO. MP73417	Prep Date 01/20/2023	Expiration Date 01/21/2023	Prepared By Mohan Bera	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_5 (HG	
FROM	495.00000ml of W2606 + 5.00000ml	of M5425 =	EFinal Quanti	ty: 500.000 ml			A)	01/20/2023

1349 CRA/CRI (Hg 0.2 PPB SOLUTION) MP73418 01/20/2023 01/21/2023 Mohan Bera None METALS_PIP ETTE_5 (HG 01/20/2023	Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	<u>PipetteID</u>	Supervised By
		CRA/CRI (Hg 0.2 PPB		01/20/2023				METALS_PIP	

FROM 2.50000ml of M5425 + 247.30000ml of W2606 + 0.20000ml of MP73407 = Final Quantity: 250.000 ml

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Metals STANDARD PREPARATION LOG

Recipe <u>ID</u> 1350	NAME CHK STD (Hg 7.0 PPB SOLUTION)	NO. MP73419	Prep Date 01/20/2023	Expiration Date 01/21/2023	Prepared By Mohan Bera	ScaleID None	PipettelD METALS_PIP ETTE 5 (HG	
FROM	2.50000ml of M5425 + 240.50000ml	of W2606 +	7.00000ml of	MP73407 = F	inal Quantity: 29	50.000 ml	A)	01/20/2023

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
887	AQUA REGIA FOR HG ON 7471A	MP73420	01/20/2023	01/21/2023	Mohan Bera	None	None	01/20/2023

FROM 150.00000ml of M5418 + 50.00000ml of M5425 = Final Quantity: 200.000 ml

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Metals STANDARD PREPARATION LOG

<u>ID</u> <u>NAME</u>		<u>NO.</u>	Prep Date	Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
68 STANNOI SOLUTIO	_	<u>1P73437</u>	01/23/2023	01/24/2023		METALS_SCA LE_3 (M SC-3)		01/23/2023

FROM 450.00000ml of W2606 + 50.00000gram of M4920 + 50.00000ml of M5418 = Final Quantity: 500.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u> 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	NO. MP73473	Prep Date 01/24/2023	<u>Date</u> 02/05/2023	<u>By</u> Bin He	<u>ScaleID</u> None	PipetteID METALS PIP	Sarabjit Jaswal
	TOT THE OTHER BEIN (OOTHOR TOOR)	<u> </u>	0172472020	02/00/2020	BiiTTiC	140110	ETTE_3 (A)	01/27/2023

FROM 125.00000ml of M5418 + 2350.00000ml of W2606 + 25.00000ml of M5425 = Final Quantity: 2500.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID 903	NAME ICP AES RINSE SOLN	NO. MP73474	Prep Date 01/24/2023	Expiration Date 02/05/2023	Prepared By Bin He	ScaleID None	PipetteID METALS_PIP ETTE 3 (A)	
FROM	200.00000ml of M5425 + 9800.0000	I Oml of W260	I 06 = Final Qu	antity: 10000.0	00 ml			01/2//2023

Rec				Expiration	<u>Prepared</u>			Supervised By
IC	NAME	NO.	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
90	4 ICP AES ICSA SOLN	MP73475	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE 3 (A)	
								01/27/2023

FROM 10.00000ml of M5127 + 90.00000ml of MP73473 = Final Quantity: 100.000 ml

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Metals STANDARD PREPARATION LOG

3494 ICP AES ICSAB SOLN-1 MP73476 01/24/2023 02/05/2023 Bin He None METALS_PIP ETTE_3 (A) 01/27/2023	Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal
	3494	ICP AES ICSAB SOLN-1	<u>MP73476</u>	01/24/2023	02/05/2023	Bin He	None	_	

FROM 0.10000ml of M4880 + 0.10000ml of M4882 + 0.10000ml of M4939 + 0.10000ml of M5228 + 0.10100ml of M4589 + 10.00000ml of M5127 + 10.00000ml of M5220 + 79.50000ml of MP73473 = Final Quantity: 100.000 ml

Recipe				Expiration	<u>Prepared</u>			Supervised By
<u>ID</u> 907	NAME ICP AES STD S (S5)	NO. MP73477	Prep Date 01/24/2023	<u>Date</u> 02/05/2023	<u>By</u> Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP	Sarabjit Jaswal
	, , ,						ETTE_3 (A)	01/27/2023

FROM 5.00000ml of M4589 + 5.00000ml of M4880 + 5.00000ml of M4882 + 5.00000ml of M4939 + 5.00000ml of M5100 + 5.00000ml of M5224 + 5.00000ml of M5228 + 5.00000ml of M5393 + 460.00000ml of MP73473 = Final Quantity: 500.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	<u>NAME</u>	<u>NO.</u>	Prep Date	Expiration Date	<u>Prepared</u> <u>By</u>	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
910	ICP AES STD S4	<u>MP73478</u>	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE_3 (A)	-
FROM	100.00000ml of MP73473 + 100.000	00ml of MP	73477 = Fina	l Quantity: 200.	000 ml			

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
909	ICP AES STD S3	MP73479	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

FROM 150.00000ml of MP73473 + 50.00000ml of MP73477 = Final Quantity: 200.000 ml

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

Metals STANDARD PREPARATION LOG

Recipe ID 3913	NAME ICP AES STD S2	NO. MP73480	Prep Date 01/24/2023	Expiration Date 02/05/2023	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_3 (A)	Supervised By Sarabjit Jaswal 01/27/2023
FROM	16.00000ml of MP73477 + 184.0000	Oml of MP7	3473 = Final (Quantity: 200.0	00 ml			

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
911	ICP AES CCV SOLN	MP73481	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

FROM 100.00000ml of MP73473 + 100.00000ml of MP73477 = Final Quantity: 200.000 ml

FROM

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		
3651	LR CHECK 1	MP73482	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE_3 (A)	01/27/2023		
FROM	FROM 10.00000ml of M5201 + 18.00000ml of M5193 + 18.00000ml of M5200 + 18.00000ml of M5290 + 20.00000ml of M5289 +									

10.00000ml of M5201 + 18.00000ml of M5193 + 18.00000ml of M5200 + 18.00000ml of M5290 + 20.00000ml of M5289 + 9.00000ml of M4894 + 7.00000ml of MP73473 = Final Quantity: 100.000 ml

Recipe ID	NAME	<u>NO.</u>	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipetteID</u>	Supervised By Sarabjit Jaswal
3652	LR CHECK2	MP73483	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE_3 (A)	,

10.00000ml of M5387 + 2.50000ml of M4844 + 25.0000ml of M5226 + 3.50000ml of M4891 + 4.50000ml of M5184 + 5.0000ml of M4768 + 54.50000ml of MP73473 = Final Quantity: 100.000 ml

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Metals STANDARD PREPARATION LOG

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	<u>ScaleID</u>	<u>PipettelD</u>	Supervised By Sarabjit Jaswal		
2951	ICP AES S1/CRI WORK STD	MP73484	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE_3 (A)	01/27/2023		
EDOM	EDOM 196 00000ml of MP73473 + 4 00000ml of MP73192 = Final Quantity: 200 000 ml									

Recipe ID	NAME	NO.	Prep Date	Expiration Date	Prepared By	ScaleID	PipetteID	Supervised By
912			01/24/2023	02/05/2023	Bin He		METALS_PIP ETTE 3 (A)	Sarabjit Jaswal
							L11L_0 (//)	01/2//2023

FROM 0.02500ml of M5019 + 0.02500ml of M5020 + 0.25000ml of M5218 + 0.25000ml of M5228 + 10.00000ml of M5291 + 89.87500ml of MP73473 = Final Quantity: 100.000 ml



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-2196-01 / Hydroxylamine Hydrochloride, Crystal (cs/4x500g)	0000215387	06/25/2025	07/01/2019 / RICHARD	06/07/2019 / RICHARD	M4371
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3624-05 / Sodium Chloride, Crystal (cs/4x2.5kg)	0000237721	04/13/2026	10/03/2022 / Ankita	10/30/2019 / AMANDEEP	M4459
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Labpure	0919120 / Boiling Stones	26275770	07/07/2025	07/03/2020 / mohan	05/07/2020 / mohan	M4583
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	R2-MEB694243	06/29/2024	07/13/2020 / bin	07/02/2020 / bin	M4589
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Supplier Absolute Standards, Inc.	ItemCode / ItemName 58024 / Chromium, Cr, 500 ml, 1000 PPM	Lot # 082620	l -	-		
Absolute	58024 / Chromium, Cr, 500		Date	Opened By 11/11/2020 /	Received By 10/28/2020 /	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-5 / ICV (HG)STOCK SOLN	ICV5-0415	04/30/2023	11/25/2022 / mohan	04/20/2021 / mohan	M4794
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 /	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	030221	03/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4876
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	072821	07/28/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4877



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57042 / Mo, 1000 PPM, 125 ml	072821	07/28/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4878
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
			Expiration	Date Opened /	Received Date /	Chemtech
Supplier	ItemCode / ItemName	Lot #	Date	Opened By	Received By	Lot #



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	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.	57022 / Ti, 1000 PPM, 125 ml	070721	07/07/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4888
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	073021	07/30/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4889
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	031921	03/19/2024	08/25/2021 / bin	08/05/2021 / jaswal	M4891
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute	58126 / Fe, 10000 PPM,	061021	06/10/2024	07/26/2021 /	06/25/2021 /	M4894



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57005 / B, 1000 PPM, 125 ml	031921	03/19/2024	08/06/2021 / jaswal	08/06/2021 / jaswal	M4901
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	080321	08/03/2024	08/06/2021 / jaswal	08/06/2021 / jaswal	M4902
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3227-05 / Potassium Permanganate (2.5kg)	210800	03/31/2026	11/30/2022 / mohan	07/28/2021 / mohan	M4916
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-3980-01 / Stannous Chloride (cs/4x500g)	210800	03/31/2026	05/28/2022 / mohan	07/28/2021 / mohan	M4920
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	030221	03/02/2024	09/23/2021 / bin	09/22/2021 / bin	M4939
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	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 #
Inorganic Ventures	MSHG-10PPM / MERCURY HCI 125mL 10ug/mL	S2-HG709270	09/22/2026	05/28/2022 / mohan	01/27/2022 / mohan	M5062
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-1 / CLP CAL SOLUTION #1, 125mL	R2-MEB689870	02/14/2024	03/14/2022 / bin	04/29/2020 / bin	M5100
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
			08/20/2024	12/05/2021 /	10/05/2021 /	



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART A / ICSA (ICP) STOCK SOLN	ICSA-1211	04/26/2023	10/26/2022 /	04/20/2021 / bin	M5127
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58025 / Mn, 1000 PPM, 500 ml	060122	06/01/2025	07/01/2022 / bin	06/02/2022 / jaswal	M5184
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58120 / Ca, 10000 PPM, 500 ml	082021	08/20/2024	06/23/2022 / bin	09/25/2021 / bin	M5193
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	092121	09/21/2024	06/23/2022 / bin	10/05/2021 / bin	M5200
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Absolute Standards, Inc.	57119 / Potassium (K) 10,000PPM	062321	06/23/2024	06/23/2022 / bin	10/05/2021 / bin	M5201
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	S2-MEB711674	07/01/2024	07/01/2022 / bin	09/10/2021 / bin	M5218



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	ICSB-0710	04/26/2023	10/26/2022 /	04/20/2021 / bin	M5220
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57051 / Sb, 1000 PPM, 125 ml	101521	10/15/2024	06/29/2022 / bin	10/18/2021 / bin	M5224
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58029 / Cu, 1000 PPM, 500 ml	022822	02/28/2025	06/15/2022 / bin	03/30/2022 / bin	M5226
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57023 / V, 1000 PPM, 125 ml	100121	10/01/2024	07/01/2022 / bin	10/18/2021 / bin	M5227
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57038 / Sr, 1000 PPM, 125 ml	073021	07/30/2024	11/27/2022 / jaswal	07/05/2022 / bin	M5228
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
PCI Scientific Supply, Inc.	1403 / Hydrogen Peroxide, 30% 1 gal	820803	02/01/2023	10/01/2022 / Al-Terek	09/07/2022 / bin	M5285



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Aluminum (AI) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58112 / Mg, 10000 PPM, 500 ml	071222	07/12/2025	09/02/2022 / jaswal	07/21/2022 / jaswal	M5290
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	ICV-1 / ICV (ICP/ICPMS) STOCK SOLN	ICV-1014	03/12/2023	09/12/2022 / bin	02/20/2020 / bin	M5291
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	S2-MEB710999	10/18/2025	11/24/2022 / bin	08/11/2022 / bin	M5317
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #
Inorganic Ventures	WW-LFS-2 / Laboratory Fortified Stock Solution 2, 125 ml	R2-MEB693161	05/20/2024	11/24/2022 / bin	08/11/2022 / bin	M5322
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57056 / Ba, 1000 PPM, 125 ml	072122	07/21/2025	11/01/2022 / jaswal	09/18/2022 / jaswal	M5387



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB714159	12/12/2023	10/12/2022 / bin	09/19/2022 / bin	M5393
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CLPP-CAL-3 / CLP CAL SOLUTION #3, 125mL	T2-MEB714159	11/28/2023	11/28/2022 / bin	09/19/2022 / bin	M5394
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Seidler Chemical	BA-9530-33 / Hydrochloric Acid, Instra-Analyzed (cs/6x2.5L)	22E1662006	06/22/2023	12/23/2022 / Al-Terek	04/11/2022 / Al-Terek	M5408
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	06/27/2023	01/02/2023 / bin	01/28/2022 / Al-Terek	M5412
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	06/27/2023	01/09/2023 / Al-Terek	01/28/2022 / Al-Terek	M5414
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)	22D1462006	07/05/2023	01/06/2023 / Al-Terek	02/24/2022 / Al-Terek	M5416



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)	22D1462006	07/05/2023	01/17/2023 / Al-Terek	02/24/2022 / Al-Terek	M5418
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date /	Chemtech Lot #

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
PCI Scientific Supply, Inc.	26397-103 / PTFE BOILING STONES	26397-103g	07/09/2023	01/09/2023 / Al-Terek	01/09/2023 / Al-Terek	M5422

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	07/11/2023	01/18/2023 / Al-Terek	02/11/2022 / Al-Terek	M5425

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 ± 4 °C)

Assay Information:

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 14, 2020

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

- 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 Sains



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

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

> Arsenic, Lead, Selenium, Thallium,

500 µg/mL ea: Cadmium

1 000 µg/mL ea:

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

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

Thallium, TI 1 000 ± 7 µg/mL

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

Assay Information:

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

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

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

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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.
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- 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.

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

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

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12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

20178Ci



Certificate of Analysis

300 Technology Drive Christiansburg, VA 24073 USA inorganicventures.com

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2.0 PRODUCT DESCRIPTION

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

> Arsenic, Lead, Selenium, Thallium,

500 µg/mL ea: Cadmium

1 000 µg/mL ea:

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Thallium, TI 1 000 ± 7 µg/mL

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ANALYTE	METHOD	NIST SRM#	SRM LOT#
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8.0 HAZARDOUS INFORMATION

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10.0 QUALITY STANDARD DOCUMENTATION

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- QSR Certificate Number QSR-1034

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

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

11.2 Lot Expiration Date

- January 13, 2027
- The date after which this CRM/RM should not be used.
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11.3 Period of Validity

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

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12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

20178Ci

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





From M4452 to M4459

Received on - 10/30/2019 Received by -: AK

Material No.: 3624-05

Batch No.: 0000237721

Manufactured Date: 2019/04/15

Retest Date: 2026/04/13

Revision No: 1

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Test	Specification	Result
Assay (NaCl) (by Ag titrn)	>= 99.0 %	100.3
pH of 5% Solution at 25°C	5.0 - 9.0	6.0
ACS – Insoluble Matter	<= 0.005 %	< 0.001
lodide (I)	<= 0.002 %	< 0.002
Bromide (Br)	<= 0.01 %	< 0.01
Chlorate and Nitrate (as NO3)	<= 0.003 %	< 0.001
ACS – Phosphate (PO ₄)	<= 5 ppm	< 5
Sulfate (SO ₄)	<= 0.004 %	< 0.004
Barium (Ba)	Passes Test	PT
ACS – Heavy Metals (as Pb)	<= 5 ppm	< 5
Iron (Fe)	<= 2 ppm	< 2
Calcium (Ca)	<= 0.002 %	< 0.001
Magnesium (Mg)	<= 0.001 %	< 0.001
Potassium (K)	<= 0.005 %	0.002

For Laboratory, Research or Manufacturing Use

Meets Reagent Specifications for testing USP/NF monographs

Country of Origin:

US

Packaging Site:

Paris Mfg Ctr & DC



M4371

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

Suitable for Mercury Determination (hydroxylammonium chloride)

Rec - 06.07.12





Material No.: 2196-01

Batch No.: 0000215387

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

Revision No: 1

Certificate of Analysis

Meets ACS Reagent Chemical Requirements,

Test	Specification	Result
Assay (NH2OH·HCl) (by KMnO4 titrn)	>= 96.0 %	99.1
Clarity of Alcohol Solution	Passes Test	PT
Residue after Ignition	<= 0.050 %	0.017
Titrable Free Acid (meq/g)	<= 0.25	0.19
Ammonium (NH4)	Passes Test	PT
Sulfur Compounds (as SO ₄)	<= 0.005 %	< 0.003
Trace Impurities - ACS - Heavy Metals (as Pb)	<= 5 ppm	4
Trace Impurities - Iron (Fe)	<= 5 ppm	< 3
Trace Impurities - Mercury (Hg)	<= 0.050 ppm	< 0.005

For Laboratory, Research or Manufacturing Use

Country of Origin:

CN

Packaging Site:

Paris Mfg Ctr & DC



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

Jamie Ethier
Vice President Global Quality

WAZY DX.



Manufacturer:

Saint-Gobain Performance Plastics 11 Sicho Drive Poestenkill, NY 12140

Certificate of Conformance

Part Number		Customer Part Number/ Revision:	1069103 N/A
Description:	*PTFE BOILING STONES-450 GR	AMS	
Lot Number:	26275770	Lot Quantity:	10 EA
Date of Manufacture (MM/DD/YY)	03/23/20	Expiration Date: (MM/DD/YY)	N/A
(Refer to th	Post Processing Run Number: ne attached Certificate for Additional Detail)		N/A

We certify the material listed above confirms in full with the following specifications:

All items have been manufactured, inspected, tested, and accepted in accordance with our Quality Management system, ISO 9001-2015. Documentation substantiating this certification is kept on record per the Company's retention policy and is available for review.

All materials and processes used in manufacturing conform to the materials and/or manufacturing specifications and notes indicated on the purchase order, drawing, specifications, quality assurance requirements, or other applicable documents effective on the date of manufacture.

Saint-Gobain does not warrant the product for any particular application and it is the responsibility of the user to conduct tests that are deemed necessary to determine the suitability of the product for any particular use. Saint-Gobain's sole responsibility shall be for failure to manufacture the product in accordance with specifications and requirements of the buyer, and from defects in material and workmanship. This warranty is expressly made in lieu of any and all other warranties and Saint-Gobain's sole liability shall be to replace any product not in conformance with the specification and requirements of the buyer.

Quality Approval:	goodla Kondla	Date:	05/13/20	
	,			



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

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2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

 Catalog Number:
 CHEM-CLP-4

 Lot Number:
 R2-MEB694243

 Matrix:
 3% (v/v) HNO3

 3% (v/v) HF

Value / Analyte(s): 1 000 µg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Titanium, Ti 1 000 \pm 7 μ g/mL

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

Assay Information:

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 29, 2020

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

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

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

Michael 2 Booth

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

Paul R Sains

Absolute Standards, Inc.

800-368-1131 www.absolutestandards.com



Certified Reference Material CRM

19410105

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

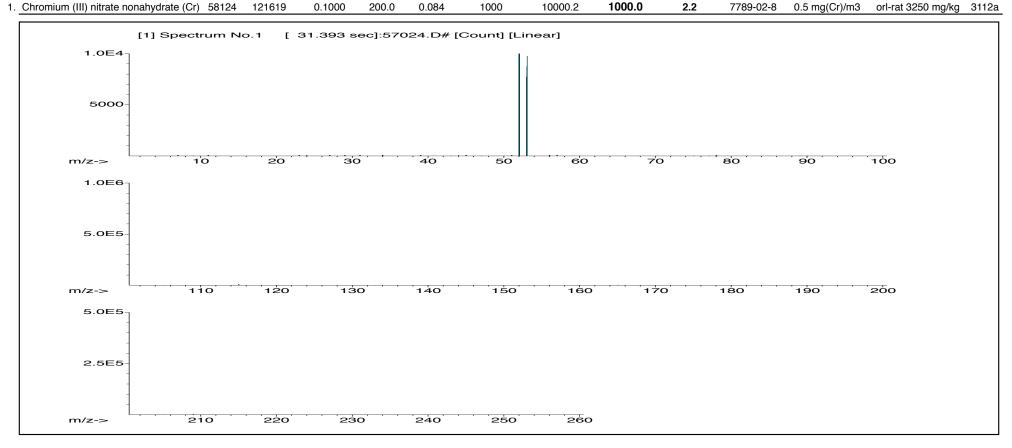
SDS Information

(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

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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):

	B	В	Ве	Ба	3 43	^	£ 5	Δ			
	<0.02	< 0.02	<0.01	<0.02	2.02	70.02	20.02	20.03			
	C.	င္၀	5	CS	9	3	. E	2			
	<0.02	< 0.02	<0.02	<0.02	<0.02	20.2	\$0.0Z	20.02			
	Au	Ge	Ga	Gd	Eu	1 [ī. Uy				
	<0.02	< 0.02	<0.02	<0.02	<0.02	<0.02	<0.02				
	P,	La	Fe	lr	In	Но	: #				
	<0.00	< 0.02	<0.2	<0.02	<0.02	<0.02	<0.02			Trace V	
	Z	Mo	Hg	Mn	Mg	Lu	, <u>r</u>			etals	
20.02	200	<0.02	<0.2	< 0.02	<0.01	<0.02	<0.02			Verifica	
,	ς.	Ŗ	P	Pd	Os	Nb	Z			tion	
7.0.7	2	<0.02	< 0.02	< 0.02	< 0.02	<0.02	-		101	by ICP-N	
JC.	c	Sm	Ru	Rb	Rh	Re	Ρŗ		\(\frac{1}{2}\)	2	
<0.02	3	<0.02	<0.02	< 0.02	< 0.02	<0.02	< 0.02		9/1111/	/m/)	
1 a		S	Sr	Na	Ag	Si	Se				
<0.02		<0.02	<0.02	<0.2	<0.02	<0.02	<0.2				
=	9 5	ŝ	Tm	Th	TI	Te	Ть				
<0.02	0.02	2003	<0.02	<0.02	< 0.02	< 0.02	< 0.02				
17	1 1	7,	Υ	Yb	<	U	W				
<0.02	10.02	200	<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).



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.

M4797 M4793 M4794 M4794 M4791 M4791

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

> Safety Data Sheets Available Upon Request

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

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



RMs ICV 1, 5, 6 SFAM.docx



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 $K_3Fe(CN)_6$, Type II water, and 0.1 % sodium hydroxide, and will decompose rapidly if exposed to light.

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

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

	ICV1-1014	
lement	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
	510	100
Cd	10000	2000
Ca	520	100
Cr	520	100
Co	510	100
Cu	10000	2000
Fe	1000	200
Pb	6000	1200
Mg	520	100
Mn	530	110
Ni	9900	2000
K	1000	200
Se	250	50
Ag	10000	2000
Na	1000	210
TI	500	100
V Zn	1000	200

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

Absolute Standards, Inc.

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Certified Reference Material CRM

19410105

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

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

Description: Cobalt (Co)

Part

Expiration Date: 020824

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

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

Lot

Formulated By: Lawrence Barry 020821

Serviewed By: Pedro L. Rentas 020821

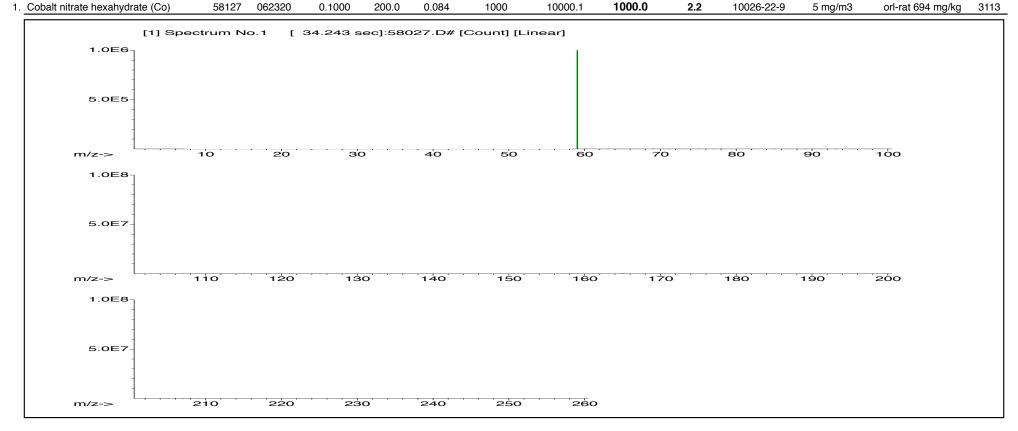
SDS Information

(Solvent Safety Info. On Attached pg.)

Compound

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

Nominal



Certified Reference Material CRM



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

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

							Trace 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).

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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:

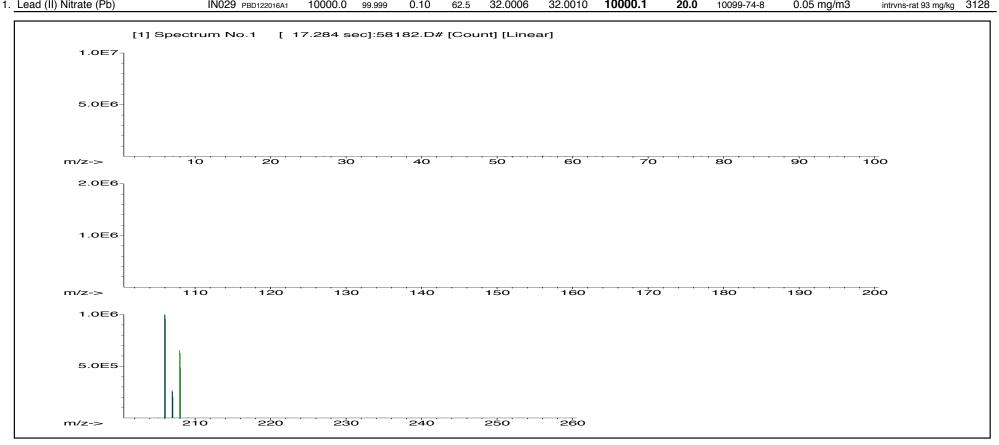
NIST Test Number: 6UTB 5E-05 Balance Uncertainty

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	y Uncertainty Assa	y Target	Actual A	Actual Uncerta	inty (So	lvent Safety Info. On A	ttached pg.)	NIST
Compound	RM# Number	Conc. (µg/mL) (%	Purity (%) (%) Weight (g)	Weight (g) Conc	c. (μg/mL) +/- (μg	/mL) CAS#	OSHA PEL (TWA)	LD50	SRM
1 Lood (II) Nitrato (Db)	INIO20	10000 0	0.10 00	r 20,000e	22.0010 10	0000 1 000	10000 74.0	0.0E ma/m2		0100



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 Me	tals	Verifica	tion	by ICP-N	ИS (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).

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

19410105

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57033

 Lot Number:
 012521

Description: Arsenic (As)

Expiration Date: 012524

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

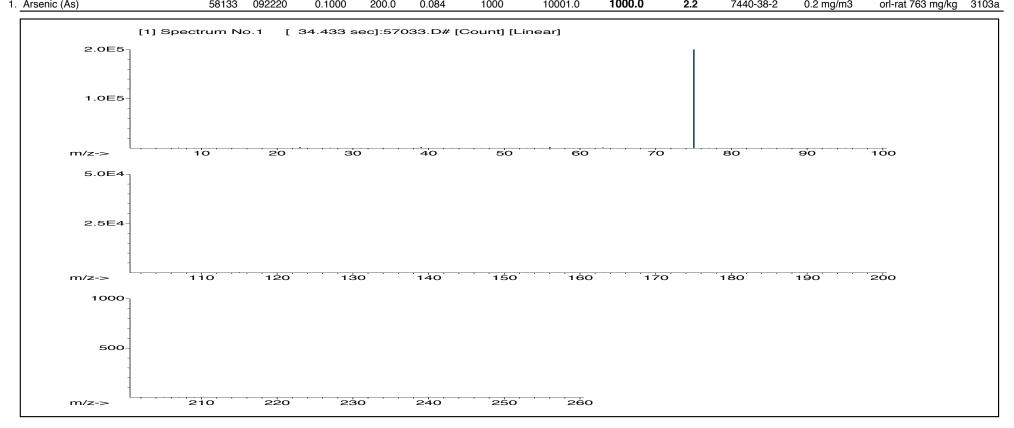
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

Formulated By: Lawrence Barry 012521

Adds Reviewed By: Pedro L. Rentas 012521

SDS Information

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



Certified Reference Material CRM



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

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

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

Certified by:

Bu P. Sha

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

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Certified Reference Material CRM

19410105

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: <u>57004</u>

Lot Number: 030221

Description: Beryllium (Be)

Part

Expiration Date: 030224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

NIST Test Number: 23060 5E-05 Balance Uncertainty

Dilution

Initial

Uncertainty

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

Lot

Formulated By: Lawrence Barry 030221

Lawrence Barry 030221

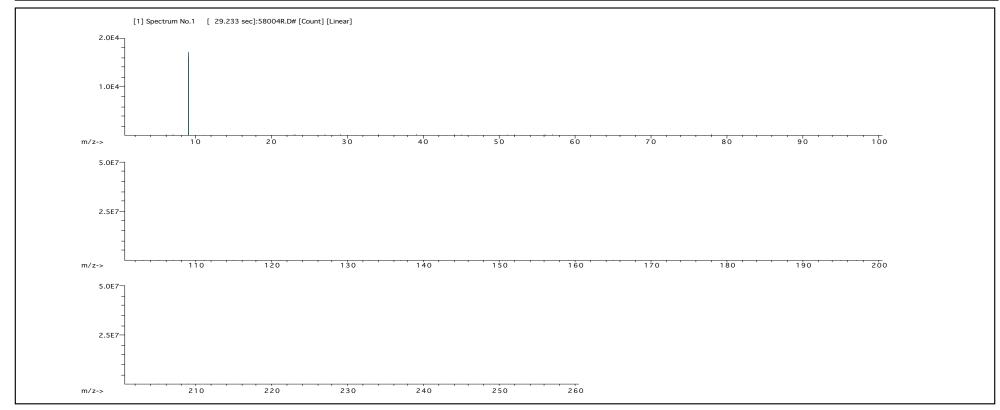
Reviewed By: Pedro L. Rentas 030221

SDS Information

(Solvent Safety Info. On Attached pg.)

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

Nominal



Certified Reference Material CRM



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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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

20370011

2.0%



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NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

> Part Number: 57048 072821 Lot Number:

Description: Cadmium (Cd)

Part

Expiration Date: 072824

Recommended Storage: Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

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

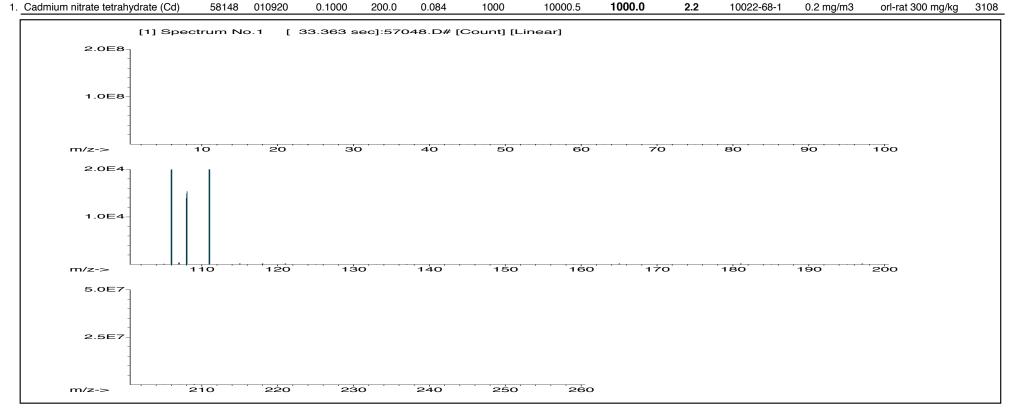
Volume shown below was diluted to (mL): 2000.02 0.058 Flask Uncertainty

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

SDS Information

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

Nominal



Certified Reference Material CRM



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

Bu P. All

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

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Certified Reference Material CRM



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CERTIFIED WEIGHT REPORT: Nominal Concentration (µg/mL): Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: Description: Lot Number: 57042 072821 **BTU9** 1000 072824 Ambient (20 °C) Molybdenum (Mo) 2000.02 0.058 5E-05 Balance Uncertainty Flask Uncertainty MKBQ8597V Ammonium hydroxide Lot # 0.5% Solvent: (ME) 10.0 Ammonium hydroxide Formulated By: Reviewed By: Dievanie LASSEL Giovanni Esposito Pedro L. Rentas SDS Information 072821 072821

Compound

Number Part

Number Lot

Vol. (ml.) Pipette (ml.) Conc. (µg/ml.)

Conc. (µg/mL)

Conc. (µg/mL)

Dilution Factor

Initial

Uncertainty

Nominal

Initial

Final

Uncertainty +/- (µg/mL)

(Solvent Safety Info. On Attached pg.)

CAS#

OSHA PEL (TWA)

LD50

TSIN SRM

Expanded

M/z->	1.0E6	m/z->	1000	2000	1.0E5	2.005
						[1] S _[[1]
N10		110		10		[1] Spectrum No.1
N N		120		20	×	Z 0.1
ŏ		ő		O		8.59
230		130		30)4 sec]:5
240		140		40		8.594 sec]:57042.D# [Count] [Linear]
						* [Coun
250		150		50		t] [Linea
260		160		60		
		170		70		
		180		80		
		190		90		
		200		100		

1 of 2

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

		Ве					Constant Property		The same of the last of the la
<0.02	40.02	40.01	40.02	<0.2	40.02	<0.02	The State of State of		THE REAL PROPERTY AND ADDRESS OF THE PERSONS NAMED IN
Cu	င္ပ	Ü,	S	င့	Ca	Cd			Care Company or Parket
< 0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02			CONTRACTOR AND ADDRESS OF THE PERSONS AND ADDRESS AND ADDRESS OF THE PERSONS AND ADDRESS OF THE PERSON
Αu	Ge	Ga	Gd	턉	띡	Dy			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			The second secon
Pb	La	Fe	Ιτ	'n	Но	ЭH			Control of the last of the las
<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02		Trace M	The real Property lies and the least lies and the lies and the least lies and the least lies and the least lies and the least lies and the lies and the least lies and the least lies and the
Nd	Mo	Hg	Mn	Mg	Lu	Ľ		/letals	
<0.02	Н	<0.2	<0.02	40.01	<0.02	<0.02		Verifica	
×	7	P	Pd	o _s	No.	Ž.		tion	
<0.2	40.02	<0.02	<0.02	<0.02	<0.02	<0.02		by ICP-M	
Sc	Sm	Ru	Rb	Rh	Re	Pr		S (µg	
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		J/mL)	
Ta	s	Sr	Na	Ag	Si	Se			
<0.02	<0.02	<0.02	40.2	<0.02	<0.02	40.2			
Ti	Sn	Tm	긁	=======================================	Te	т			
<0.02	<0.02	40.02	40.02	40.02	40.02	<0.02			
Zr	Zn	×	4,4	<	C	W			
<0.02	40.02	<0.02	40.02	40.02	<0.02	<0.02			

(1)= larger arrange

Physical Characterization:

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

Certified by:

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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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NIST

<u>CERTIFIED WEIGHT REPORT:</u>

Lot # Solvent:

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

Description: Phosphorous (P)

Expiration Date: 051124

Part

Recommended Storage: Ambient (20 °C)

Nominal Concentration (μg/mL): 1000

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

Dilution

Initial

Uncertainty

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

Lot

Formulated By: Lawrence Barry 051121

Lawrence Barry 051121

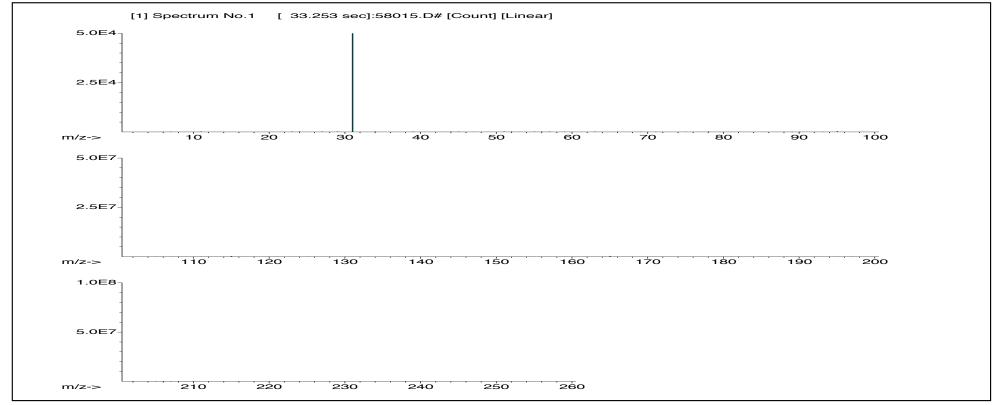
Reviewed By: Pedro L. Rentas 051121

SDS Information

(Solvent Safety Info. On Attached pg.)

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

Nominal



Certified Reference Material CRM



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

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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

20370011

2.0%



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CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57082

 Lot Number:
 062221

Description: Lead (Pb)

Expiration Date: 062224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

Formulated By: Lawrence Barry 062221

Lawrence Barry 062221

Reviewed By: Pedro L. Rentas 062221

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

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



Certified by:

Bur P. All

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

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

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

(T)= Target analyte

Physical Characterization:

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

- * 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

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Certified Reference Material CRM

ASTM Type 1 Water

051721



Expanded

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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

> Part Number: 57016 Lot Number:

051721 **Description:** Sulfur (S)

Expiration Date: 051724

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

SDS Information

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

250

260

240



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

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

Bu f. All

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57034

 Lot Number:
 070221

Description: Selenium (Se)

Expiration Date: 070224

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

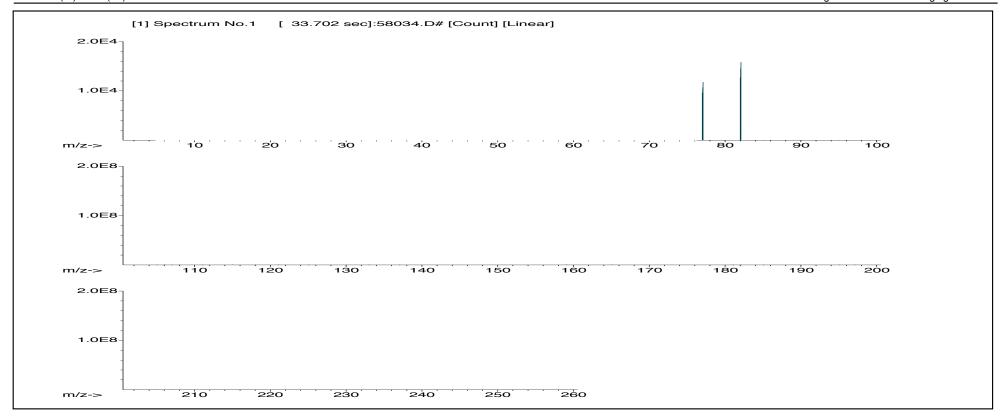
Formulated By: Giovanni Esposito 070221

Lector Denta 070221

Reviewed By: Pedro L. Rentas 070221

SDS Information

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





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

Sn P. Shi

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

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Certified Reference Material CRM

19410105

2.0%

Nitric Acid

Nitric Acid



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

> Part Number: 57014 030921 Lot Number:

Description: Silicon (Si)

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

Recommended Storage: Ambient (20 °C)

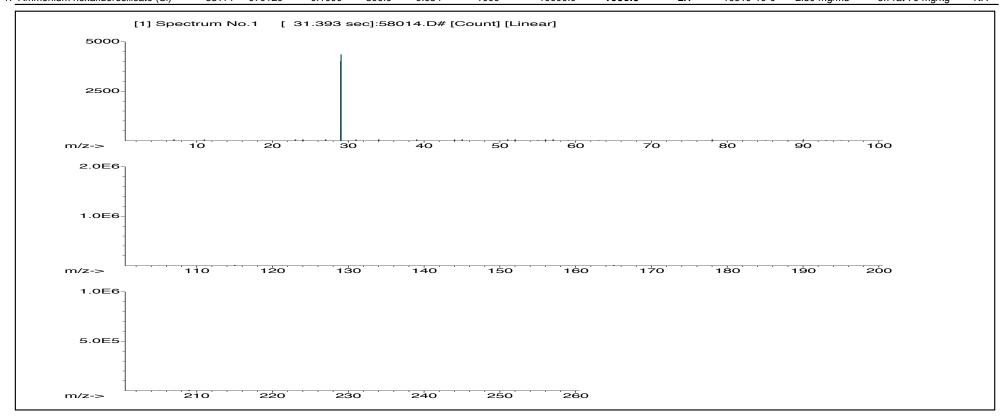
Nominal Concentration (µg/mL): 1000

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

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

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

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





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

Bu K. Spla

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Nitric Acid

Expanded

20370011

2.0%



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):

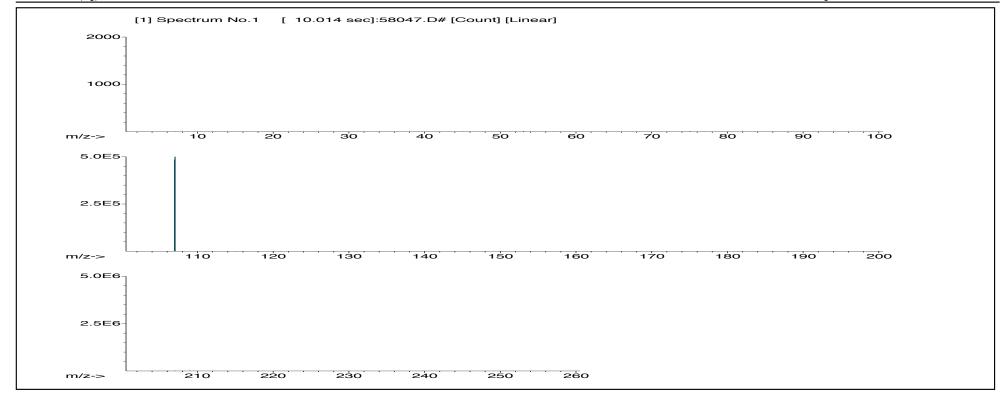
> **NIST Test Number:** 6UTB 5E-05 Balance Uncertainty

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

Bu P. Sha

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

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Part

Certified Reference Material CRM



Expanded

SDS Information

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NIST

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

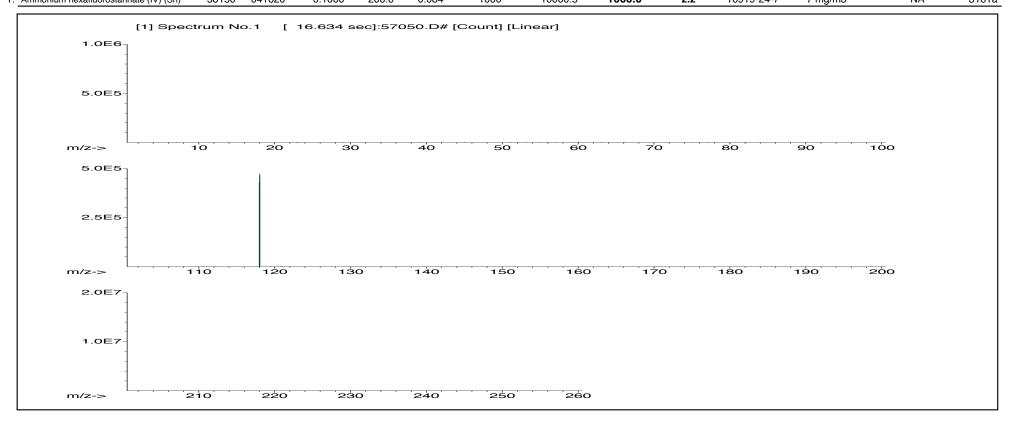
Description: Tin (Sn) 2.0% 40.0 Nitric Acid Formulated By: Lawrence Barry 021121 **Expiration Date:** 021124 6.0% 120.0 Hydrochloric acid **Recommended Storage:** Ambient (20 °C) (mL) 1000 Nominal Concentration (µg/mL): **NIST Test Number:** 23060 5E-05 Balance Uncertainty Reviewed By 021121 Pedro L.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

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

Initial

Final

Nominal





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

Bu f. All

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

							Trace M	etals	Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	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.
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- * Standards are certifed (+/-) 0.5% of the stated value, unless otherwise stated.
- * All standards should be stored with caps tight and under appropriate laboratory conditions.
- * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

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

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Certified Reference Material CRM

20370011

2.0%

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57022

 Lot Number:
 070721

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

Expiration Date: 070724

Part

Recommended Storage: Ambient (20 °C)

Nominal Concentration (μ g/mL): 1000

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

Dilution

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

Lot

Formulated By: Lawrence Barry 070721

Lawrence Barry 070721

Reviewed By: Pedro L. Rentas 070721

SDS Information

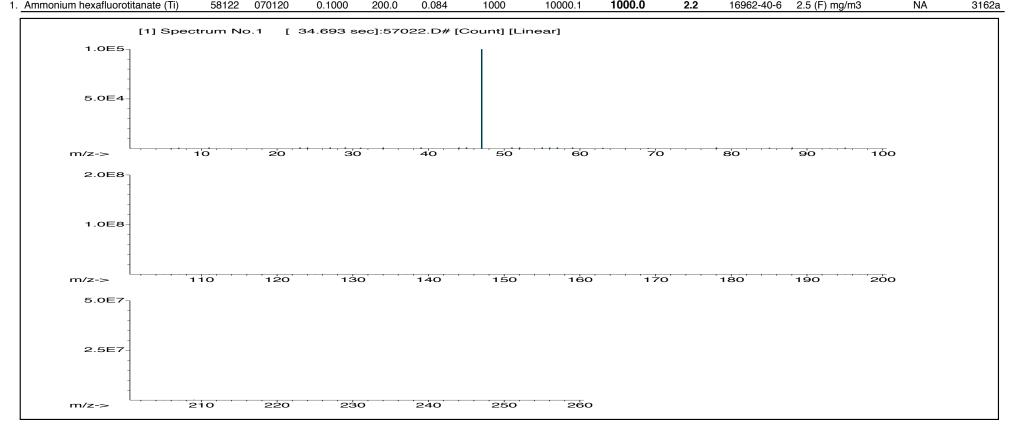
(Solvent Safety Info. On Attached pg.)

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

Nominal

Uncertainty

Initial





Certified by:

Bu f. All

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

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

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

(T)= Target analyte

Physical Characterization:

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

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

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

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

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Certified Reference Material CRM

20370011

Nitric Acid

40.0

(mL)

Nitric Acid



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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 57081

 Lot Number:
 073021

Description: Thallium (TI)

2.0% **Expiration Date:** 073024

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

Formulated By: Giovanni Esposito 073021

Reviewed By: Pedro L. Rentas 073021

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

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



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

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

Initial

Nitric Acid

Final

Expanded

Uncertainty

20370011

2.0%



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

NIST

CERTIFIED WEIGHT REPORT: Lot # Solvent:

 Part Number:
 58030

 Lot Number:
 031921

Description: Zinc (Zn)

Part

Expiration Date: 031924

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

Dilution

Initial

Uncertainty

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

Lot

Formulated By: Giovanni Esposito 031921

Licks Kenta

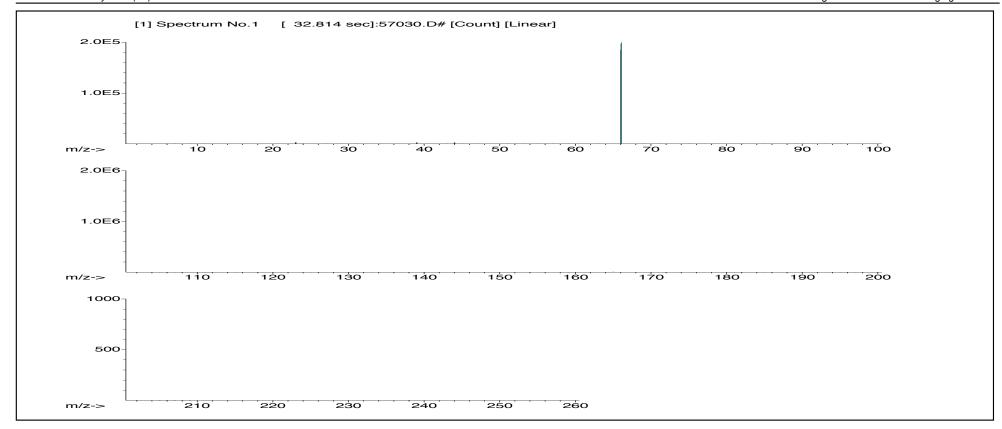
Reviewed By: Pedro L. Rentas 031921

SDS Information

(Solvent Safety Info. On Attached pg.)

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

Nominal





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

Bn f. Sfla

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.

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

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

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

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

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

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

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

Absolute Standards, Inc. 800-368-1131

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Certified Reference Material CRM 06/25/21

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

CERTIFIED WEIGHT REPORT: Part Number: HPRHM Lot #

Lot Number: 58126 061021

Solvent: 20370011

Nitric Acid

Description: Iron (Fe)

7.0%

210.0

Nitric Acid

Formulated By:

Giovanni Esposito

061021

061021

TSIN

Giovannie

arear L

(mL)

Expiration Date:

061024

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

Lot

Nominal

Purity Uncertainty Assay

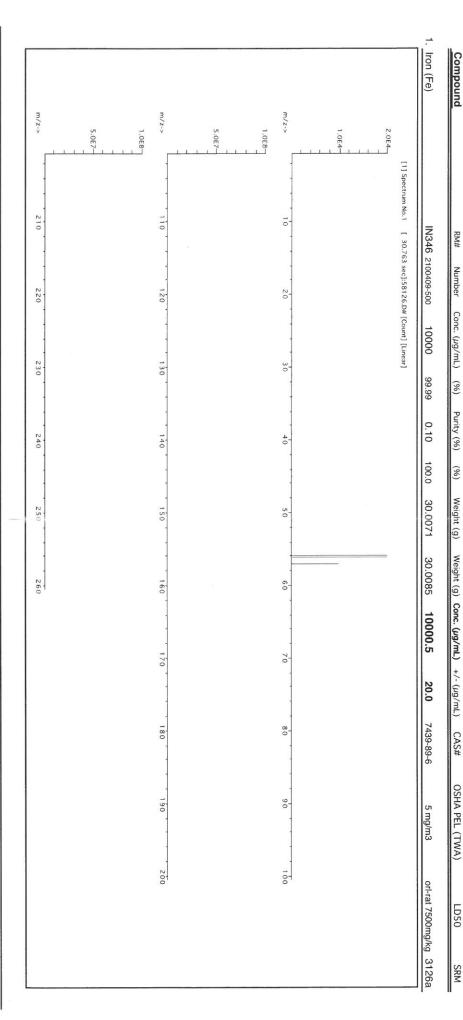
Target

Actual

Actual

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

Recommended Storage: Ambient (20 °C) Expanded Uncertainty Reviewed By: SDS Information
(Solvent Safety Info. On Attached pg.)
LD50 Pedro L. Rentas



Part # 58126



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

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

							Trace N	Metals	Verif	ication	by ICP-MS	lS (μg/)/L)						
Al	<0.3	Са	<0.1	Dy	<0.1	Ж	<0.1		<0.1	Z.	75	Pr	<0.1	Se	<0.5	Тb	<0.1	W	<0.1
Sb	4	Ca	۵	Er	<0.1	Но	<0.1	Lu	<0.1	N _P	<0.1	Re	<0.1	S:	<10	Te	<0.1	U	<0.3
As	۵	Се	<0.1	Eu	<0.1	Ín	<0.1	M _{SG}	< 0.5	O _s	<0.1	Rh	<0.1	Ag	<0.1]	<0.1	<	<0.3
Ba	<0.1	Cs	<0.1	Gd	<0.1	Ιτ	<0.1	Mn	85	Pd	<0.1	Rb	<0.1	Na	۵	Th	<0.1	Yb	<0.1
Ве	<0.1	Cr	33	Ga	۵	Fe	Т	Hg	<0.1	P	<0.1	Ru	<0.1	Sr	<0.1	Tm	<0.1	~	<0.1
Bi	<0.1	Со	80	Ge	60	La	<0.1	Mo	۵	Pt	<0.1	Sm	<0.1	s	<0.1	Sn	۵	Zn	<45
В	٥.	Cu	50	Au	<0.1	Pb	<0.3	Nd	<0.1	7	۵	Sc	<0.1	Ta	<0.1	Ti	<0.1	Zr	<0.1

(T)= Target analyte

Physical Characterization:

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

Certified by:

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

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

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

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

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

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Certified Reference Material CRM



Expanded

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

CERTIFIED WEIGHT REPORT: Lot # Solvent:

Part Number: 57005 MKBQ8597V Ammonium hydroxide

Lot Number: 031921
Description: Boron (B)

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

Recommended Storage: Ambient (20 °C)

Nominal Concentration (µg/mL): 1000

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

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

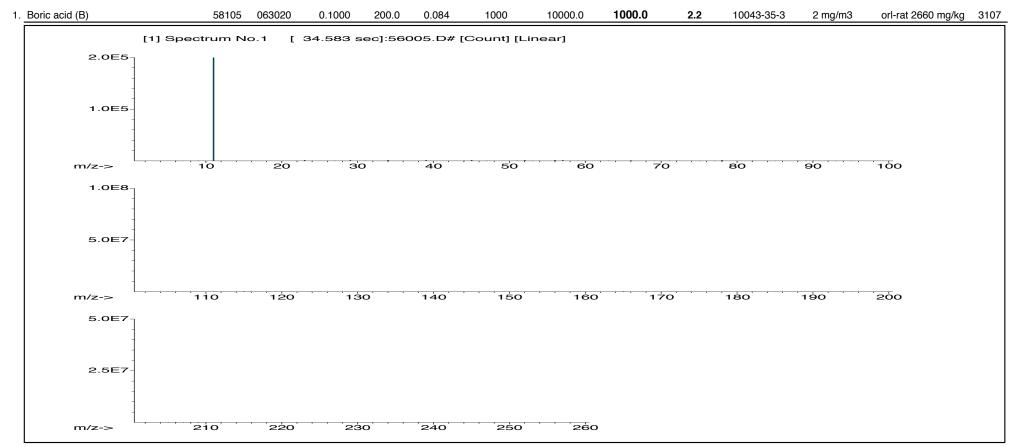
Formulated By: Giovanni Esposito 031921

Lista Henta

Reviewed By: Pedro L. Rentas 031921

SDS Information

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





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

Bu P. Sha

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

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Certified Reference Material CRM

Nitric Acid

40.0

(mL)

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

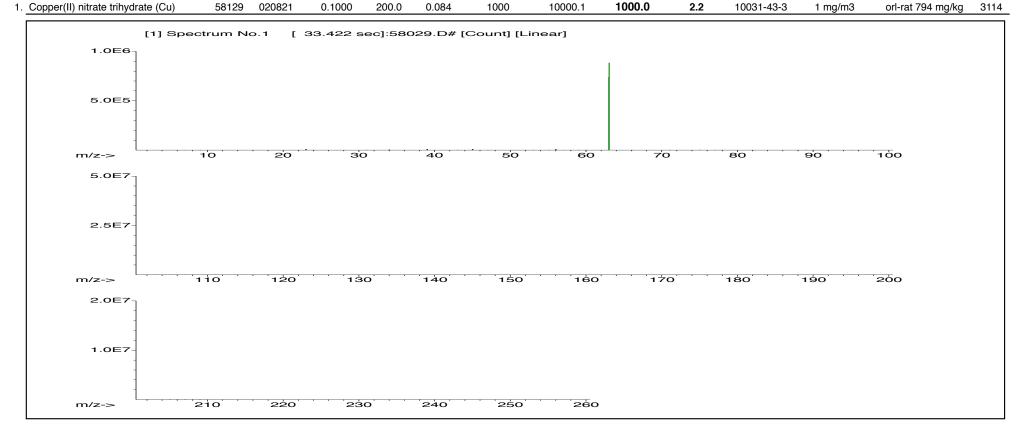
Formulated By: Lawrence Barry 080321

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





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

Instrumental Analysis by Inductively Coupled Plasma Mass 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	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

Part # 58029 Lot # 080321 2 of 2 Printed: 8/23/2021, 11:15:06 PM



M4913- 16



Certificate of Analysis

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

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

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

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

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

Julian Burton

Julian Burton - Quality Control Manager - Fair Lawn



M4917- 20

Certificate of Analysis

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

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

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

Catalog Number	T142	Quality Test / Release Date	03/22/2021
Lot Number	210800		
Description	STANNOUS CHLORIDE, DIF	HYDRATE CERTIFIED ACS (Suitable for Me	ercury Determination)
Country of Origin	United States	Suggested Retest Date	Mar/2026
Chemical Origin	Inorganic-non animal		
BSE/TSE Comment		as starting raw material ingredients, or used material that might migrate to the finished p	

N/A			
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Clear crystals
ASSAY	%	Inclusive Between 98 - 103	101.56
CALCIUM	%	<= 0.005	<0.005
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
IRON (Fe)	%	<= 0.003	<0.003
LEAD (Pb)	%	<= 0.01	<0.01
MERCURY (Hg)	ppm	<= 0.05	<0.05
POTASSIUM (K)	%	<= 0.005	<0.005
SODIUM (Na)	%	<= 0.01	<0.01
SOLUBILITY IN HCL	PASS/FAIL	= PASS TEST	PASS TEST
SULFATE (SO4)	PASS/FAIL	= P.T. (ABOUT 0.003%)	P.T. (ABOUT 0.003%)

Julian Burton

Julian Burton - Quality Control Manager - Fair Lawn



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



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

B B AS							
4 0.02							140
5 5 5	-	<u>ک</u>	<u>چ</u>	2	8		
A 0.02	<0.02		<0.02	40.2	<0.02		
5 E	2		Eu	T.	Dy		
40.02	20.02	2	<0.02	<0.02	40.02		
िस म	F		7	Но	Hf		
	40.2	<0.02	<0.02	<0.02	<0.02		Trace Mo
Mo	Нд	Mn	Mg	Ŀ	1.1		letals
20.02	402	<0.02	10.0>	<0.02	Т		Verifica
7 7	р -р	Pd	S _O	¥	Z.		tion I
A.0.2	A 0.02	<0.02	40.02	<0.02	<0.02		by ICP-M
Sm	S R	Rb	Rh	Re	Pr		in) S
40.02	40.02	<0.02	<0.02	<0.02	<0.02		g/mL)
- J	s Sr	Na	Ag	Si	Se		
A).02	40.02	40.2	<0.02	40.02	<0.2		
H K	S II	규	Ħ	Te	4T	STREET, STREET	
A) (2)	A.02	<0.02	<0.02	<0.02	<0.02		
72	7 ~	4,	<	c	W		
A 0.02	40.02	40.02	<0.02	40.02	40.02		

(T)= Target analyte

Physical Characterization:

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

Certified by:

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

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

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Certified Reference Material CRM



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

Gierannie

reporter

5%

Nitric Acid

(III) 25.0

> Formulated By: Giovanni Esposito

> > 100721

Reviewed By:

Pedro L. Rentas

100721

(Solvent Safety Info. On Attached pg.)

OSHA PEL (TWA) LD50 SDS Information

Indium Oxide (In)

IN086 W1096A

10000

99.999

0.10

82.6

6.05408

6.05441

10000.6

20.1

1312-43-2

X

X

3124a

NIST SRM

RM#

Number Lot

Conc. (µg/mL)

8

Purity (%)

8

Weight (g)

Weight (g) Conc. (µg/mL)

+/- (µg/mL)

CAS#

Target

Actual

Actual

Uncertainty Expanded

Nominal

Purity Uncertainty Assay

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

10000

Ambient (20 °C)

Recommended Storage:

Expiration Date:

100724

Weight shown below was diluted to (mL):

500.06

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

2.5E6	m/z->	1.0E6	m/z-> 2.0E6	2.5E7	5.0E7
270	110		10		[1] Spectrum No.1
220	120		20		
230	130		30		965 sec]:57
N 40	140		40		[12.965 sec]:57049.D# [Count] [Linear]
2500	150		50		.nt] [Linear]
260	160		60		
	170 180		70 80		
	190		90		
	200		100		



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

	CHILI	-	NO DESCRIPTION OF THE PERSON NAMED IN COLUMN			and the	020	H		179
	ш	Bi	Be	Ва	As	Sb	2			
	0.02	<0.02	<0.01	40.02	40,2	<0.02	<0.02			
	5	င္ပ	Ç	CS	Çe	Ca	Cd			
	<0.02	<0.02	<0.02	<0.02	<0.02	40.2	<0.02			
	Au	ල	Ga	<u>G</u>	臣	먁	Dy			
	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
	B	La	æ	F	In	Но	Hf	NO PROPERTY.		
	<0.02	<0.02	<0.2	<0.02	7	<0.02	<0.02		Trace Me	:
	Z.	Mo	Hg	Mn	Mg	Lu	Ľ		letals	
Tarnet analyte	8	<0.02	40.2	< 0.02	10.05	<0.02	<0.02		Verificat	
anaktu	~	P	P	Pd	0°	S.	Z		d noi:	
	3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		y ICP-MS	
5	s	Sm	R _L	Rb	Rh	Re	Pr		(lig	
20.00	4000	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<u>m</u> L)	
100	1	S	Sr	Za	Ag	Si	Se			
20.02	3	<0.02	<0.02	40.2	<0.02	40.02	<0.2			
	1	Sn	Tm	T	11	Te	Тb			
20.02	3	40.02	40.02	40.02	<0.02	<0.02	<0.02			
1	7,	Zn	Y	44	<	c	W			
70.02	3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	P. Land B. C. Britain		

(I)= larger analyte

Physical Characterization:

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

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

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CERTIFIED WEIGHT REPORT:



Certified Reference Material CRM



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

180/08 Lot #

Part Number: Lot Number: Description: 052521 Yttrium (Y) 58139

Solvent: 20370011

Nitric Acid

2%

Nitric Acid

Formulated By:

Lawrence Barry

052521

052521

Lumine

<u>a</u> 40.0

Expiration Date: 052524

Nominal Concentration (µg/mL): Recommended Storage: **6UTB** 10000 Ambient (20 °C)

Weight shown below was diluted to (mL): **NIST Test Number:** 2000.02 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Expanded Pedro L. Rentas SDS Information

-	II.	
Yttrium (III) Oxide (Y)	Compound	
IN087	RM#	
IN087 YV012015B1	Number	Lot
10000	er Conc. (µg/mL) (%) Purity (%) (%) \	Nominal
99.999	(%)	Purity
0.10	Purity (%)	Uncertainty
77.9	(%)	Assay
77.9 25.6744 25.6745	Weight (g)	Target
25.6745	Weight (g)	Actual
10000.0	Conc. (µg/mL)	Actual
20.0 1314-36-9	onc. (µg/mL) +/- (µg/mL) CAS#	Uncertainty
1314-36-9	CAS#	(Solv
NA	OSHA PEL (TWA)	(Solvent Safety Info. On Attached pg.)
N	LD50	thed pg.)
N N	SRM	NIST

m/z->	1.0∈5	2.0E5	m/z->	2.5E4	0. 0. 1. 1.	m/z->	1.0E6	2.016
210			110			10		
N						N		
220			120			20		
230			130			30		
M								
240			140			4		
250			150			50		
260			160			60		
			170			70		
			180			80		
			190			90		
			200			100		

Part # 58139

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

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

(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.

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Part # 58139

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CERTIFIED WEIGHT REPORT:



Certified Reference Material CRM

RA



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

011421 57116 Lot Number: Part Number:

Sulfur (S) Description:

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

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

5E-05 Balance Uncertainty

ASTM Type 1 Water

011421

Solvent:

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) Z Purity (%) (%) Conc. (µg/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



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800-368-1131



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

The state of							I lace me	vetais	Verillication	5	를 한) CIVI-	/JIII/8/						
Al	<0.02	ਤ	<0.02	Dy	<0.02	Ħ	<0.02	ij	<0.02	Z	<0.02	Pr	<0.02	Se	<0.2	TP	<0.02	*	<0.02
Sp	<0.02	రౌ	40.2	占	<0.02	Ho	• <0.02	3	<0.02	£	<0.02	Re	<0.02	Si	<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	A2	<0.02	Ag	<0.02	E	<0.02	>	<0.02
Ba	<0.02	ొ	<0.02	B	<0.02	긔	<0.02	M	<0.02	R	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	χp	<0.02
Be	40.01	ర	<0.02	g _a	<0.02	Fe	40.2	Hg	<0.2	Д,	<0.02	Ru	<0.02	Si	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	රි	<0.02	g	<0.02	Ľ	<0.02	Mo	<0.02	┺	<0.02	Sm	<0.02	S	T	Sn	<0.02	Zn	<0.02
В	<0.02	♂	<0.02	Αn	<0.02	Pb	< 0.02	PN	<0.02	Х	<0.2	Sc	<0.02	Ta	<0.02	Ε	<0.02	Z	<0.02

Physical Characterization:

(T)= Target analyte

Certified by:

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

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CERTIFIED WEIGHT REPORT:

Part Number: Lot Number: 57115 032921

Solvent: 20370011

Nitric Acid

Lot #

2%

Nitric Acid

Formulated By:

Lawrence Barry

032921

Rurance

(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
-	000001	032921

NIST SRM 3186

	1. Ammonium dihydrogen phosphate (P)			Compound		
	IN008 PV052018A1		MAIN	BM#		
	V052018A1		1	Nimber	בפר	2
	10000		Conc. (July 1111)	Cons (male)	Monningi	Nominal
	99.999		(9%)		Furity	0
	0.10		Punty (%)		Uncertainty Assay	
	27.3		(%)		ASSAY	•
The second name of the second na	109.9063		Weight (g)		larget	•
	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	(1447)	OSHA DEL (TWA)	(Solvent Salety line, on Attached bg.)	ant Cafaty late On Att	and information
1 44 1	NA A	רביטט	DEO	acried pg.)	noted and	3

m/z->	. 2500	m/z->	500	m/z->	2.564	5.0€4
				•		[1] Spe
210		110		0		[1] Spectrum No.1
220		120		N _O		
8		ā		30		12.074
230		130				sec]:581
240		140		4		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				
		0		100		



		В	Bi:	Be	Ва	3	>	Sb	Α		
		0.0	<0.02	0.0	٥.٥	6	3	- A	00		
		_	_								
		5	င္ပ	ζ	C	8	3 6	<u>.</u>	2		
		<0.02	40.02	<0.02	40.02	<0.02		7	40.02		
		Au	Ge	Ga	DQ.	Eu	1	ų į	Dγ		
		∆ 0.02	40.02	40.02	<0.02	<0.02	20.02	3 6	A)A		
		Р	<u></u>	ਸ਼ ਜ	r,	In	HO	: :	HF		
	1000	A) 03	40.02	A) 2	40.02	<0.02	<0.02	20.02	2003	11900	1
		Z :	Mo de	H ₀	M	Mg	Lu			INCLU	Note
	ŀ								1	V V V	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
(T)= Target analyte	20.07	000	3 6	3	0.02	20.01	0.02	20.02	2		
rget an	7	۲ ;	ģ -	o ;	P	၀ွ	N _p	2			
alyte	7.03	20.02	3 -	10:00	400	40.02	<0.02	40.02		by ICP-I	
	Sc	mc	? 2	7 8	5	Rh	Re	7		D F	5
	40.02	40.02	40.02	\$0.02	3 8	8	A).02	<0.02		/g/mL)	
	Ta	· v.	y,	. 2	31.6	Ag	S:	Se			
	<0.02	40.02	<0.02	8	20.02	3	A) (2)	402			
	Ti	Sn	Tm	-	1 =	= ;	,	7			
	<0.02	<0.02	40.02	<0.02	20.02	9 9	A 89	<0.02	PARTICIPATION STREET		
	Zr	Zn	×	4,4	<	; (=	W			
	<0.02	<0.02	<0.02	<0.02	20.02	2002	3	40.02			

Physical Characterization:

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

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Certificate of Analysis

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

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:

Single Analyte Mass Spec Solution

Catalog Number:

MSHG-10PPM

Lot Number:

S2-HG709270

Matrix:

10% (v/v) HCI

Value / Analyte(s):

10 μg/mL ea:

Mercury

Starting Material:

Hg metal

Starting Material Lot#:

1959

Starting Material Purity:

99.9994%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value:

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

Density:

1.020 g/mL (measured at 20 ± 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods

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

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

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

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

the variance.

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

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

k = coverage factor = 2

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

u_{bb} = bottle to bottle homogeneity standard uncertainty

ults = long term stability standard uncertainty (storage)

uts = transport stability standard uncertainty

Characterization of CRM/RM by One Method

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

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

Xa = mean of Assay Method A with

uchar a = the standard uncertainty of characterization Method A

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

k = coverage factor = 2

u_{char a} = the errors from characterization

ubb = bottle to bottle homogeneity standard uncertainty

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

uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 22, 2021

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

11.2 Lot Expiration Date

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

11.3 Period of Validity

Sealed TCT	Bag	Open Date:		

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Mya Truong

Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director Paul R Laines





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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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







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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

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

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

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

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

ICSA M5126 M5127 M5128 M5129 M5130

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

value \pm 15 percent of the listed certified value.

ICSB

M5219

M5220

M5221

M5222

M5223

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Certified Reference Material CRM

R: 6/2/22

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

CERTIFIED WEIGHT REPORT: Manganese(II) nitrate tetrahydrate (Mn) Compound Nominal Concentration (µg/mL): m/z-> m/z-> m/z-> 5.0E7 1.0E8 5.0E7 1.0E8 2.5E6 5.0E6 Recommended Storage: Volume shown below was diluted to (mL): **NIST Test Number: Expiration Date:** Part Number: [1] Spectrum No.1 Lot Number: Description: 210 110 10 58125 Number Part **BTU9** 1000 58025 060122 Ambient (20 °C) 060125 Manganese (Mn) 021022 Number 120 220 20 Lot [34.243 sec]:57025.D# [Count] [Linear] 3000.41 0.1000 Dilution Factor 230 130 30 M5184 Vol. (mL) Pipette (mL) Conc. (µg/mL) 300.0 0.058 Flask Uncertainty 5E-05 Initial Balance Uncertainty 140 Uncertainty 240 40 0.084 20510011 Nominal Lot # 2.0% 1000 150 250 50 Conc. (µg/mL) Nitric Acid Solvent: 10000.5 Initial (mL) 60.0 260 160 60 Conc. (µg/mL) Nitric Acid 1000.0 Final 170 70 Formulated By: Reviewed By: Uncertainty +/- (µg/mL) Expanded 2.1 180 Ferne 80 20694-39-7 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) 190 Pedro L. Rentas Lawrence Barry 90 SDS Information 5 mg/m3 100 200 orl-rat >300mg/kg 060122 060122 3132 TSIN SRM

www.absolutestandards.com



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

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(T)= Target analyte

Physical Characterization:

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

Certified by:



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

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





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Certified Reference Material CRM



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

CERTIFIED WEIGHT REPORT: Part Number:

58120 082021 Solvent: 20370011 Lot # Nitric Acid

Lot Number: Description: Calcium (Ca)

Recommended Storage: **Expiration Date:** 082024

2%

60.0 (<u>1</u>)

Nitric Acid

Formulated By:

Giovanni Esposito

082021

Pedro L. Rentas

082021

SDS Information

Horana

Laborate

Ambient (20 °C)

Nominal Concentration (µg/mL): NIST Test Number: **BTU3** 10000

Weight shown below was diluted to (mL): 3000.4 0.058 Flask Uncertainty 5E-05 Balance Uncertainty Reviewed By: Expanded

IN014 cazaszo1941 10000 99.995 0.10 39.9 75.1986 75.2065 10001.0 20.0 471-34-1 5 mg/m3
IN014 CAZD82019A1 10000 99.8995 0.10 39.9 75.1986 75.2065 10001.0
[1] Spectrum No.1 [12.514 sec]:58120.D# [Count] [Linear]

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Certified Reference Material CRM



Absolute Standards, Inc.

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800-368-1131



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

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Physical Characterization:

(T)= Target analyte

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



Certified by:

Lot # 082021

2 of 2

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

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

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

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

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

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

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Certified Reference Material CRM

0



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

CERTIFIED WEIGHT REPORT:

Part Number: Lot Number:

Lot #

Solvent: 20370011 Nitric Acid

2%

60.0 (IE)

Nitric Acid

Formulated By:

Giovanni Esposito

092121

Pedro L. Rentas

092121

SDS Information

Giranie

rapider

Description: Sodium (Na)

092121 58111

Recommended Storage: **Expiration Date:** 092124

Ambient (20 °C)

Nominal Concentration (µg/mL): 10000

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

kg 3152a	orl-rat 3236 mg/kg 3152a	5 mg/m3	7631-99-4	20.0	10001.4	111.1274 111.1433	111.1274	27.0	0.10	99.999	10000 99.999	IN036 NAV01201511	IN036	1. Sodium nitrate (Na)
SRM	LD50	OSHA PEL (TWA)	CAS#	+/- (µg/mL)) Conc. (µg/mL) +/- (µg/mL) CAS#	Weight (g)		(%)	Purity (%)	11 -	Conc. (µg/mL)	Number	RM#	Compound
NIST	tached pg.)	(Solvent Safety Info. On Attached pg.)	(So	Uncertainty	Actual	Actual	Target	Assay	Purity Uncertainty Assay		Nominal	Lot		

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

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

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Physical Characterization:

(1)= Target analyte

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

Certified by:

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

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

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

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

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

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

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

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



Mellona

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10/0/12

Fot #

Nitric Acid Solvent: 20370011 Potassium (K) 062321 57119

> Lot Number: Description:

Part Number:

CERTIFIED WEIGHT REPORT:

40.0 (mL) %

Nitric Acid

NIST 062321 062321 SDS Information
(Solvent Safety Info. On Attached pg.) Pedro L. Rentas Gabriel Helland CAS# Formulated By: Reviewed By: Weight (g) Conc. (µg/mL) +/- (µg/mL) Uncertainty Expanded Actual Actual Weight (g) Target Uncertainty Assay 8 5E-05 Balance Uncertainty 0.058 Flask Uncertainty Purity (%) Purity (%) Conc. (µg/mL) 2000.02 Nominal Ambient (20 °C) Weight shown below was diluted to (mL): 062324 Number 10000 **6UTB** ĕ RW# **Expiration Date:** Recommended Storage: Nominal Concentration (µg/mL): NIST Test Number: Compound

Potassium nitrate (K)		IN034 KZ062019A1 10000	10000	866.66	0.10	38.2	52.3570	52.3590	0.10 38.2 52.3570 52.3590 10000,4 20,0 7757-79-1	20.0	7757-79-1	5 ma/m3	ori-rat 3015 molec 3141a
	[1] Spectn	[1] Spectrum No.1 [35.763 sec]:581	35.763	sec]:58	119.D#	Cou	19.D# [Count] [Linear]	ari				h	Bulling
2.0E6													
1.0E6													
~-z/w	0	80	Ø	30	6		9	09	70		90	06	100

Lot # 062321 Part # 57119

260

250

230

210

<-z/ш

5000

200

190

180

170

160

150

140

130

120

110

1.0E4 m/z->

2.0E5

1.0E5

Certified Reference Material CRM





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

ANAB ISO 17034 Accredited

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

							Trace Me	etals	Verifical	ation	by ICP-MS	VIS	(ng/mL)						
		ALCONOMICS.		STATE STATE OF		Sec. at Column	SAMPLE SECTION SECTION	THE DESIGNATION	Secretary and a second										
[A	<0.02	2	<0.02	Ų.	<0.02	HŁ	<0.02	Ľ	<0.02	Z	<0.02	뇬	<0.02	Se	<02	TP	<0.02	M	<0.02
Sp	<0.02	೮	40.2	山	<0.02	He	<0.02	3	<0.02	£	<0.02	æ	<0.02	Si	<0.02	Te	<0.02	D	<0.02
As	<0.2	ප	<0.02	盘	<0.02	ᄪ	₹0.02	Mg	<0.01	ő	<0.02	Rh	<0.02	Ag	<0.02	E	<0.02	>	<0.02
Ba	<0.02	ర	<0.02	B	<0.02	ㅂ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Ħ	<0.02	Yb	<0.02
Be	<0.01	Ċ	<0.02	Ča	<0.02	æ	402	Hg	<0.2	Ы	<0.02	Ru	<0.02	Şr	<0.02	Tm	<0.02	7	<0.02
Bi	<0.02	රි	<0.02	ප	<0.02	2	₹0.02	Mo	<0.02	K	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	<0.02
В	<0.02	ರೆ	<0.02	Au	<0.02	Ps	<0.02	PN	<0.02	X	L	ઝ	<0.02	Ta	<0.02	F	<0.02	77	<0.02

Physical Characterization:

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



(T)= Target analyte



* 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.

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



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: CHEM-QC-4

Lot Number: S2-MEB711674

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

3 /0 (V/V) I II

Value / Analyte(s): 1 000 μg/mL ea:

Boron, Molybdenum,

Silicon, Tin,

Titanium

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

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

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

Assay Information:

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

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

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

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

11.2 Lot Expiration Date

- November 02, 2026

- Sealed TCT Rag Open Date:

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

11.3 Period of Validity

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

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

Michael 2 Booth

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Certifying Officer:

Paul Gaines

Chairman / Senior Technical Director

Paul R Saines





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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

analyses.

Contains Heavy Metals
HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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







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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

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

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

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

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

ICSA M5126 M5127 M5128 M5129 M5130

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

value \pm 15 percent of the listed certified value.

ICSB

M5219

M5220

M5221

M5222

M5223

Absolute Standards, Inc.

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: 57051 101521 Lot Number:

Description: Antimony (Sb)

Part

Expiration Date: 101524

Recommended Storage: Ambient (20 °C)

1000 Nominal Concentration (µg/mL):

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

> > Dilution

Initial

Uncertainty

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

Lot

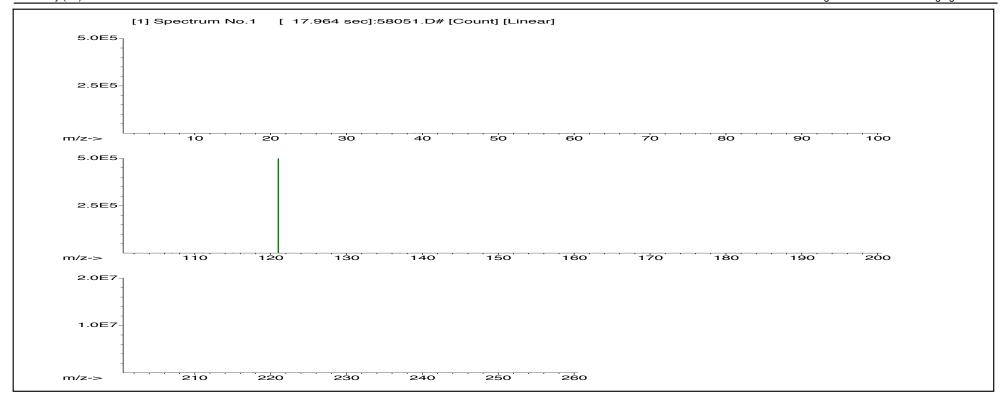
Giovanni Esposito Giovanni Esposito Formulated By: 101521 Reviewed By Pedro L. Rentas 101521

SDS Information

(Solvent Safety Info. On Attached pg.)

Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
 Antimony (Sb) 	58151	081820	0.1000	200.0	0.084	1000	10001.5	1000.0	2.2	7440-36-0	0.5 mg/m3	orl-rat 7000 mg/kg	3102a

Nominal



Certified Reference Material CRM



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

Bu f. Spa

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

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

(T)= Target analyte

Physical Characterization: Certified by:

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

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

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

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

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

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

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

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

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

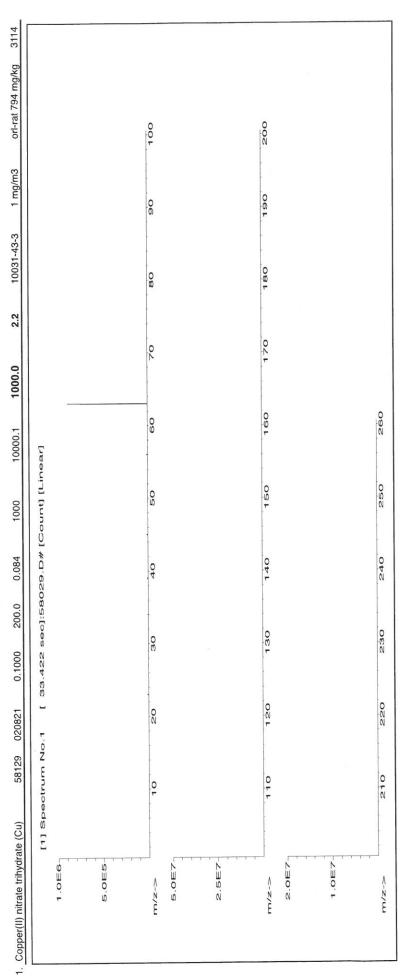
Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com

W52仏 Certified Reference Material CRM

B

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

CERTIFIED WEIGHT REPORT:						# 10T	Solvent:						ſ
Part Number: Lot Number:		58029 022822				20370011	Nitric Acid		Livannie	ž.	aposto		
Description:		Copper (Cu)	~					!	7				_
						2.0%	40.0	Nitric Acid F	Formulated By:		Giovanni Esposito	022822	ΛΙΙ
Expiration Date:		022825					(mL)		1		(
Recommended Storage:		Ambient (20 °C)	()						1	M	on the		
Nominal Concentration (µg/mL):		1000							June				_
NIST Test Number:		6UTB		5E-05	Balance Uncertainty	inty			Reviewed By:		Pedro L. Rentas	022822	ন
Volume shown below was diluted to (mL):	was diluted t	o (mL):	2000.02	0.058	Flask Uncertainty	>							
									Expanded		SDS Information		
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solve	(Solvent Safety Info. On Attached pg.)	hed pg.)	NIST
Compound	Number Number	umber	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Vol. (mL) Pipette (mL) Conc. (μ g/mL) Conc. (μ g/mL) Conc. (μ g/mL) +/- (μ g/mL)		CAS#	OSHA PEL (TWA)	LD50	SRM







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

							Trace M	Metals	Verifica	tion	by ICP-M	S (µg	J/mL)						
											The state of the s	MANAGEMENT	Managamental						SCHOOL STREET,
Α	<0.02	Cd	< 0.02	Dy	<0.02	ЭH	< 0.02	Li	<0.02	Ņ.	< 0.02	Pr	<0.02	Se	<0.2	ТЪ	<0.02	*	<0.02
Sb	< 0.02	Ca	<0.2	퍕	<0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	S:	< 0.02	Te	<0.02	C	<0.02
As	<0.2	Се	< 0.02	Eu	<0.02	In	< 0.02	Mg	<0.01	Os	< 0.02	Rh	< 0.02	Ago	< 0.02	11	<0.02	<	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	<0.02	İr	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	< 0.02	Na	<0.2	Th	<0.02	ΥЬ	<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	4	<0.02
<u>B</u> :	< 0.02	Со	< 0.02	Ge	<0.02	La	< 0.02	Mo	< 0.02	Pt	< 0.02	Sm	< 0.02	S	< 0.02	Sn	<0.02	Zn	<0.02
В	<0.02	Cu	T	Au	<0.02	Pb	<0.02	Nd	<0.02	×	<0.2	Sc	<0.02	Ta	<0.02	Ti	<0.02	Zr	<0.02
									(T)- Target analyte	analyta									

(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.

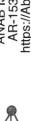
 * Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, D.C. (1994).

R: [0/18/221

Certified Reference Material CRM

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5							NIST	SRM	3165		 									
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1	S								-											

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Certified Reference Material CRM



Absolute Standards, Inc.

www.absolutestandards.com

800-368-1131



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

							Trace M	Matale	Verifica	2.5	hy ICP N	2	(Jun/ 2		and the second				
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(T)= Target analyte

Physical Characterization:

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



Certified by:

the preparation of all standards.

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

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Certified Reference Material CRM 20/65



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

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

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		170		70		_
		180		80		
		190		90		
		200		100		



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

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(I)= larget analyte

Physical Characterization:

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

Certified by:

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

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

Physical Characterization:

(I)= larger analyte

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

Certified by:

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2 of 2







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

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			Ĺ			_	_	_		_	_	

(T)= Target analyte

Physical Characterization:

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





Lot # 020422

2 of 2

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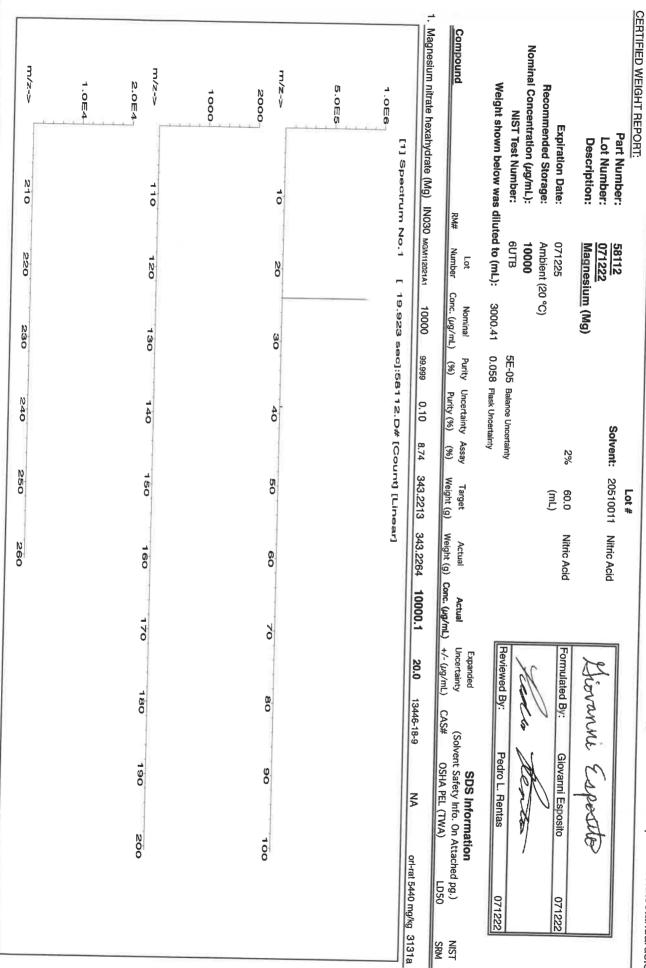
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Certified Reference Material CRM

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

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A HYSICHI CHAFACTERIZATION:

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QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY

"An ISO 9001:2015 Certified Program"

R1.02/20/21

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 CLP SOWs 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

QATS Form 20-007F169R05, 05-17-2018

(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.



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

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

(C) ANALYSIS OF SAMPLES

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

ICV1-1014

For ICP-AES use: dilute the ICV1 concentrate 10-fold with 2% (v/v) nitric acid; pipet 10 mL of the concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid.

Page 1 of 2

ICV 1, 5, 6.docx



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





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

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APTIM

Instructions for QATS Reference Material: Inorganic ICV Solutions

For ICP-MS use: dilute the ICV1 concentrate 50-fold with 1% (v/v) nitric acid; pipet 2 mL of the 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: dilute the ICV5 concentrate 100-fold with 2% (v/v) nitric acid; pipet 1 mL of the concentrate into a 100 mL volumetric flask and dilute to volume with 2% (v/v) nitric acid. The ICV5 concentrate is prepared in 0.05% (w/v) K₂Cr₂O₇ and 5% (v/v) nitric acid.

ICV6-0400

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

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

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

42.1	ICV1-1014	
Element	Concentration (µg/L) (after 10-fold dilution)	Concentration (μg/L) (after 50-fold dilution)
AI	2520	504
Sb	1010	202-
As	997	199
Ba	518	104
Be	514	103
Cd	514	103
Ca	10000	2000
Cr	517	103
Co	521	104
Cu	505	101
Fe	10100	2020
Pb	1030	206
Mg	5990	1198
Mn	524	105
Ni	525	. 105
K	9940	1988
Se	1030	206
Ag	252	50
Na	10100	2020
Ti	1040	208
V	504	101
Zn	1010	202

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

www.absolutestandards.com

CERTIFIED WEIGHT REPORT:

Part Number:

57056

Solvent:

20510011

Nitric Acid

8

40.0

Nitric Acid

Description: Lot Number:

072122 Barium (Ba)

Certified Reference Material CRM

Riograph 33

Lot #

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

Formulated By: Liovannie Giovanni Esposito appeal 2

072122

Reviewed By: Pedro L. Rentas 072122

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

1. Barium nitrate (Ba)

Nominal Concentration (µg/mL):

1000

Ambient (20 °C) 072125

NIST Test Number:

Recommended Storage:

Expiration Date:

Weight shown below was diluted to (mL):

2000.02

0.058 Flask Uncertainty

5E-05 Balance Uncertainty

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

Certified Reference Material CRM



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

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

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Physical Characterization:

(T)= Target analyte

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



Certified by:

2 of 2

^{*} 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).

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

^{*} 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).



M5408 M5409 M5410

Material No.: 9530-33 Batch No.: 22E1662006 Manufactured Date: 2022-04-11 Retest Date: 2027-04-10

Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCI) (by acid-base titrn)	36.5 - 38.0 %	37.6 %
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Specific Gravity at 60°/60°F	1.185 - 1.192	1.190
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl2)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.5 ppm	< 0.3 ppm
Sulfite (SO3)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH4)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	< 0.2 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities – Boron (B)	≤ 20.0 ppb	< 5.0 ppb
Trace Impurities – Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	37.0 ppb
Trace Impurities – Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities - Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities - Gallium (Ga)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Germanium (Ge)	≤ 3.0 ppb	< 2.0 ppb
Trace Impurities - Gold (Au)	≤ 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	1 ppb

>>> Continued on page 2 >>>



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

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

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



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

Test Specification Result

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

Country of Origin: USA





M5411 M5412 M5413 M5414 M5415

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 (HNO₃)	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 ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	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 μm and greater	≤ 60 par/ml	4 par/ml
Particle Count - 1.0 μm 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





M5411 M5412 M5413 M5414 M5415

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 (HNO₃)	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 ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	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 μm and greater	≤ 60 par/ml	4 par/ml
Particle Count - 1.0 μm 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





M5416 M5417 M5418 M5419 M5420 M5421 Material No.: 9530-33 Batch No.: 22D1462006 Manufactured Date: 2022-02-24 Retest Date: 2027-02-23

Revision No.: 0

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 ppm
ACS – Specific Gravity at 60°/60°F	1.185 - 1.192	1.190
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl ₂)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.5 ppm	< 0.5 ppm
Sulfite (SO ₃)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH4)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	0.2 ppb
Arsenic and Antimony (as As)	$\leq 5.0 ppb$	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Boron (B)	≤ 20.0 ppb	1.4 ppb
Trace Impurities - Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	48.0 ppb
Trace Impurities - Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	$\leq 1.0 ppb$	< 0.2 ppb
Trace Impurities – Germanium (Ge)	\leq 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	$\leq 4.0 ppb$	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	2 ppb

>>> Continued on page 2 >>>



Material No.: 9530-33 Batch No.: 22D1462006

Test	Specification	Result
Trace Impurities – Lead (Pb)	≤ 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	0.7 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities - Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities - Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Nickel (Ni)	≤ 4.0 ppb	< 0.3 ppb
Trace Impurities - Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	\leq 9.0 ppb	< 2.0 ppb
Trace Impurities - Selenium (Se), For Information Only		< 1.0 ppb
Trace Impurities - Silicon (Si)	≤ 100.0 ppb	< 10.0 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (Tl)	≤ 5.0 ppb	< 0.9 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	0.3 ppb
Trace Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	0.5 ppb
Trace Impurities - Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

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



Material No.: 9530-33 Batch No.: 22D1462006

Test Specification Result

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

Country of Origin: USA





M5416 M5417 M5418 M5419 M5420 M5421 Material No.: 9530-33 Batch No.: 22D1462006 Manufactured Date: 2022-02-24 Retest Date: 2027-02-23

Revision No.: 0

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 ppm
ACS – Specific Gravity at 60°/60°F	1.185 - 1.192	1.190
ACS – Bromide (Br)	≤ 0.005 %	< 0.005 %
ACS – Extractable Organic Substances	≤ 5 ppm	< 1 ppm
ACS – Free Chlorine (as Cl ₂)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.5 ppm	< 0.5 ppm
Sulfite (SO ₃)	≤ 0.8 ppm	0.3 ppm
Ammonium (NH4)	≤ 3 ppm	< 1 ppm
Trace Impurities – Arsenic (As)	≤ 0.010 ppm	< 0.003 ppm
Trace Impurities – Aluminum (Al)	≤ 10.0 ppb	0.2 ppb
Arsenic and Antimony (as As)	$\leq 5.0 ppb$	< 3.0 ppb
Trace Impurities – Barium (Ba)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	≤ 1.0 ppb	< 1.0 ppb
Trace Impurities – Bismuth (Bi)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Boron (B)	≤ 20.0 ppb	1.4 ppb
Trace Impurities - Cadmium (Cd)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	48.0 ppb
Trace Impurities - Chromium (Cr)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	≤ 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	$\leq 1.0 ppb$	< 0.2 ppb
Trace Impurities – Germanium (Ge)	\leq 3.0 ppb	< 2.0 ppb
Trace Impurities – Gold (Au)	$\leq 4.0 ppb$	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	≤ 15 ppb	2 ppb

>>> Continued on page 2 >>>



Material No.: 9530-33 Batch No.: 22D1462006

Test	Specification	Result
Trace Impurities – Lead (Pb)	≤ 1.0 ppb	< 0.5 ppb
Trace Impurities – Lithium (Li)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	≤ 10.0 ppb	0.7 ppb
Trace Impurities – Manganese (Mn)	≤ 1.0 ppb	< 0.4 ppb
Trace Impurities - Mercury (Hg)	≤ 0.5 ppb	< 0.1 ppb
Trace Impurities - Molybdenum (Mo)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Nickel (Ni)	≤ 4.0 ppb	< 0.3 ppb
Trace Impurities - Niobium (Nb)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	\leq 9.0 ppb	< 2.0 ppb
Trace Impurities - Selenium (Se), For Information Only		< 1.0 ppb
Trace Impurities - Silicon (Si)	≤ 100.0 ppb	< 10.0 ppb
Trace Impurities – Silver (Ag)	≤ 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	≤ 100.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	≤ 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (Tl)	≤ 5.0 ppb	< 0.9 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Titanium (Ti)	≤ 1.0 ppb	0.3 ppb
Trace Impurities – Vanadium (V)	≤ 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	0.5 ppb
Trace Impurities - Zirconium (Zr)	≤ 1.0 ppb	< 0.1 ppb

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



Material No.: 9530-33 Batch No.: 22D1462006

Test Specification Result

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

Country of Origin: USA



Nitric Acid CMOS



M5423 M5424 M5425 M5426 M5427 M5428

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 ₄)	≤ 0.10 ppm	< 0.03 ppm
Sulfate (SO ₄)	≤ 0.2 ppm	< 0.2 ppm
Trace Impurities - Aluminum (Al)	≤ 40.0 ppb	< 1.0 ppb
Arsenic and Antimony (as As)	≤ 5.0 ppb	< 2.0 ppb
Trace Impurities - Barium (Ba)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Beryllium (Be)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Bismuth (Bi)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Boron (B)	≤ 10.0 ppb	< 5.0 ppb
Trace Impurities - Cadmium (Cd)	≤ 50 ppb	< 1 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	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



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 μm 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



N5285 NS286 9/7/2022 A.I

CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

CERTIFICATE OF ANALYSIS

Date: 8/3/2022

Lot No 820803

Hydrogen Peroxide, ACS

Reagent Grade

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

^{***}Our Hydrogen Peroxide is considered un-stabilized because it is very slightly stabilized with Sodium Stannate, 500 ppb maximum, just for safety purposes.

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

Gina M. Rambo
Office Manager



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: WW-LFS-1
Lot Number: S2-MEB710999

Matrix: 5% (v/v) HNO3

Value / Analyte(s): 1 000 μg/mL ea:

Potassium,

600 µg/mL ea: Phosphorus,

300 μg/mL ea:

Sodium, Iron,

200 μg/mL ea:

Magnesium, Aluminum, Cerium, Selenium,

Thallium,

100 μg/mL ea:

Lead, Calcium,

80 μg/mL ea: Arsenic,

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

40 μg/mL ea: Chromium,

 $30~\mu g/mL$ ea:

Copper, Boron,

Vanadium,

20 µg/mL ea:

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

7.5 µg/mL ea: Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Aluminum, Al	CERTIFIED VALUE 200.0 ± 0.7 μg/mL	ANALYTE Arsenic, As	CERTIFIED VALUE 80.0 ± 0.5 μg/mL
Barium, Ba	20.00 ± 0.09 μg/mL	Beryllium, Be	20.00 ± 0.10 μg/mL
Boron, B	30.00 ± 0.20 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 ± 0.20 μg/mL	Cobalt, Co	20.00 ± 0.09 μg/mL
Copper, Cu	30.00 ± 0.13 μg/mL	Iron, Fe	300.0 ± 1.3 μg/mL
Lead, Pb	100.0 ± 0.5 μg/mL	Lithium, Li	20.00 ± 0.09 μg/mL
Magnesium, Mg	200.0 ± 0.8 μg/mL	Manganese, Mn	20.00 ± 0.09 μg/mL
Mercury, Hg	70.0 ± 0.3 μg/mL	Nickel, Ni	50.00 ± 0.22 μg/mL
Phosphorus, P	600.0 ± 2.7 μg/mL	Potassium, K	1 000 ± 4 μg/mL
Selenium, Se	200.0 ± 1.6 μg/mL	Silver, Ag	7.50 ± 0.05 µg/mL
Sodium, Na	300.0 ± 1.1 μg/mL	Strontium, Sr	20.00 ± 0.09 μg/mL
Thallium, TI	200.0 ± 1.4 μg/mL	Vanadium, V	30.00 ± 0.13 μg/mL
Zino Zn	20 00 + 0 09 ug/ml		

Zinc, Zn $20.00 \pm 0.09 \mu g/mL$

Density: 1.037 g/mL (measured at 20 \pm 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
В	ICP Assay	3107	110830
Ва	ICP Assay	3104a	140909
Ва	Calculated		See Sec. 4.2
Ва	Gravimetric		See Sec. 4.2
Ве	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Ca	Calculated		See Sec. 4.2
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	ICP Assay	3113	190630
Co	EDTA	928	928
Co	Calculated		See Sec. 4.2
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
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	ICP Assay	3132	050429
Mn	EDTA	928	928
Mn	Calculated	0.450	See Sec. 4.2
Na	ICP Assay	3152a	120715
Na	Gravimetric	0400	See Sec. 4.2
Ni Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Ni	Calculated	0400-	See Sec. 4.2
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	151215
V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928
Zn	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 _{CRM/RM} , where two or more methods of characterization are used is the weighted mean of the results:	Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results:
$X_{CRM/RM} = \Sigma(w_i) (X_i)$	$X_{CRM/RM} = (X_a) (u_{char\ a})$
X _i = mean of Assay Method i with standard uncertainty u _{char i}	X _a = mean of Assay Method A with
$\mathbf{w_i}$ = the weighting factors for each method calculated using the inverse square of	uchar a = the standard uncertainty of characterization Method A
the variance:	
$\mathbf{w_i} = (1/u_{\text{char }i})^2 / (\Sigma (1/(u_{\text{char }i})^2)$	
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 ² _{char a} + u ² _{bb} + u ² _{lts} + u ² _{ts}) ^y
k = coverage factor = 2	k = coverage factor = 2
$\mathbf{u_{char}} = [\Sigma((\mathbf{w_i})^2 (\mathbf{u_{char}}_i)^2)]^{1/2}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method	u _{char a} = the errors from characterization
u _{bb} = bottle to bottle homogeneity standard uncertainty	u _{bb} = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
u _{ts} = transport stability standard uncertainty	uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 18, 2021

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

11.2 Lot Expiration Date

- October 18, 2025
- The date after which this CRM/RM should not be used.
- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

Sealed TCT Bag Open Date:	

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS Certificate Approved By:

Michael Booth Director, Quality Control Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director



CERTIFICATE OF ANALYSIS

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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 $80.0\pm0.6~\mu\text{g/mL}$ Molybdenum, Mo $40.00\pm0.17~\mu\text{g/mL}$ Silica, SiO2 $200.0\pm1.5~\mu\text{g/mL}$ Tin, Sn $70.0\pm0.3~\mu\text{g/mL}$

Titanium, Ti 20.00 ± 0.12 μg/mL

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

Assav Information:

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

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 **HOMOGENEITY**

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 20, 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 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

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