

Prep Standard - Chemical Standard Summary

Order ID : 01232

Test : TCLP ICP Metals,TCLP Mercury

Prepbatch ID : PB150390,PB150432,

Sequence ID/Qc Batch ID: LB123775,LB123806,LB123806,

Standard ID :

MP71535,MP73163,MP73188,MP73192,MP73234,MP73235,MP73236,MP73375,MP73406,MP73423,MP73424,MP73425,MP73426,MP73427,MP73428,MP73429,MP73430,MP73431,MP73432,MP73433,MP73434,MP73435,MP73437,MP73473,MP73474,MP73475,MP73476,MP73477,MP73478,MP73479,MP73480,MP73481,MP73482,MP73483,MP73484,MP73485,

Chemical ID :

M4371,M4459,M4465,M4589,M4657,M4768,M4794,M4825,M4844,M4874,M4876,M4877,M4878,M4880,M4881,M4882, M4883,M4884,M4885,M4886,M4888,M4891,M4894,M4901,M4902,M4916,M4920,M4939,M4960,M4961,M5019, M5020,M5062,M5100,M5108,M5127,M5184,M5193,M5200,M5201,M5211,M5218,M5220,M5224,M5226,M5227,M5228, M5280,M5289,M5290,M5291,M5317,M5322,M5387,M5393,M5408,M5411,M5412,M5418,M5425,M5426,W2606,

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Metals STANDARD PREPARATION LOG

Recipe ID 170 FROM	NAME 1:1HCL 1250.00000ml of M5280 + 1250.000	<u>NO.</u> <u>MP71535</u> 00ml of W26	Prep Date 09/19/2022 606 = Final Q	Expiration Date 03/03/2023 uantity: 2500.0	Prepared By Bin He	<u>ScaleID</u> None	PipettelD None	Sarabjit Jaswal 09/20/2022
Recipe ID 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	<u>NO.</u> <u>MP73163</u>	Prep Date 01/02/2023	Expiration Date 02/28/2023	Prepared By Bin He	<u>ScaleID</u> None	<u>PipettelD</u> METALS_PIP ETTE_3 (A)	<u>Supervised By</u> Sarabjit Jaswal 01/03/2023

FROM 125.00000ml of M5408 + 2350.00000ml of W2606 + 25.00000ml of M5412 = Final Quantity: 2500.000 ml

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<u>Recipe</u> <u>ID</u> 919	NAME ICP AES INTERNAL STD	<u>NO.</u> MP73188	Prep Date	Expiration Date 02/28/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP	<u>Supervised By</u> Sarabjit Jaswal
FROM	1.00000ml of M4961 + 10.00000ml o ml	f M4960 + 1	969.00000ml	of W2606 + 20	0.00000ml of M5	412 = Final Qu	ETTE_3 (A)	01/05/2023
Recipe ID 2950 FROM	NAME ICP AES S1/CRI STOCK STD 0.03000ml of M4876 + 0.03000ml of of M5289 + 0.06000ml of M4881 + 0. 0.10000ml of M4939 + 0.10000ml of of M4886 + 0.20000ml of M4888 + 0. 0.50000ml of M4901 + 0.50000ml of of M5201 + 1.00000ml of M5290 + 2. 100.000 ml	NO. MP73192 M4877 + 0.0 10000ml of M5184 + 0. 20000ml of M5387 + 1,1 .00000ml of	Prep Date 01/04/2023 05000ml of M M4874 + 0.1(10000ml of M M4889 + 0.2(00000ml of M M4882 + 2.0(Expiration Date 02/28/2023 4657 + 0.05000 0000ml of M488 5228 + 0.15000 0000ml of M488 4878 + 1.00000 0000ml of M488	Prepared By Bin He Oml of M4885 + 30 + 0.10000ml Oml of M4825 + 31 + 0.20000ml Oml of M5108 + 34 + 87.38000m	ScaleID None 0.05000ml of M of M4883 + 0.1 0.20000ml of M of M5227 + 0.2 1.00000ml of M I of MP73163 =	PipettelD METALS_PIP ETTE_3 (A) 14894 + 0.0500 0000ml of M49 14768 + 0.2000 5000ml of M52 15200 + 1.0000 = Final Quantity	Sarabjit Jaswal 01/05/2023 00ml 002 + 00ml 224 + 00ml y:

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Recipe ID 3965	NAME 2:1 H2SO4 : HNO3	<u>NO.</u> MP73234	Prep Date 01/06/2023	Expiration Date 06/27/2023	Prepared By Mohan Bera	<u>ScaleID</u> None	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	1600.00000ml of M5211 + 800.0000	Dml of M541	1 = Final Qua	antity: 3200.000) ml			

Recipe				Expiration	Prepared			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	Date	By	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
65	POTASSIUM PERMANGANATE SOLUTION 5%	<u>MP73235</u>	01/06/2023	07/06/2023	Mohan Bera	METALS_SCA LE_3 (M SC-3)	None	01/06/2023
FROM	100.00000gram of M4916 + 2000.00	000ml of W2	2606 = Final	Quantity: 2000.	000 ml			

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Metals STANDARD PREPARATION LOG

Recipe ID 67	NAME SODIUM CHLORIDE - HYDROXYL- CHLORIDE	<u>NO.</u> MP73236	Prep Date 01/06/2023	Expiration Date 07/06/2023	Prepared By Mohan Bera	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	<u>PipetteID</u> None	Sarabjit Jaswal
FROM	2000.00000ml of W2606 + 240.0000	Ogram of M4	4371 + 240.00	0000gram of M4	1459 = Final Q	uantity: 2000.00	D ml	

Recipe ID 66	NAME POTASSIUM PERSULFATE SOLUTION 5 %	<u>NO.</u> <u>MP73375</u>	Prep Date 01/17/2023	Expiration Date 07/17/2023	Prepared By Mohan Bera	<u>ScaleID</u> METALS_SCA LE_3 (M SC-3)	PipetteID None	Sarabjit Jaswal
FROM	100.00000ml of M4465 + 2000.0000)ml of W260)6 = Final Qu	antity: 2000.00	0 ml			

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Recipe ID 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	<u>NO.</u> MP73406	Prep Date 01/19/2023	Expiration Date 01/25/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	125.00000ml of M5418 + 2350.0000	Dml of W260	06 + 25.00000	ml of M5425 =	Final Quantity:	2500.000 ml		
Recipe ID 871		<u>NO.</u>	Prep Date	Expiration Date	Prepared By	ScaleID	PipettelD	<u>Supervised By</u> Sarabjit Jaswal

871	250PPB WORKING STD.	<u>MP73423</u>	01/23/2023	01/24/2023	Mohan Bera	None	ETTE_5 (HG	01/23/2023
<u>FROM</u>	1.00000ml of M5425 + 2.50000ml of	M5062 + 96	6.50000ml of V	V2606 = Final	Quantity: 100.0	00 ml	A)	

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Recipe ID 1340 FROM	NAME Hg 0.00 PPB STD 2.50000ml of M5425 + 247.50000ml	<u>NO.</u> <u>MP73424</u> of W2606 =	Prep Date 01/23/2023 Final Quanti	Expiration Date 01/24/2023 ty: 250.000 ml	Prepared By Mohan Bera	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023	
Recipe ID 1341	NAME Hg 0.2 PPB STD	<u>NO.</u> MP73425	Prep Date 01/23/2023	Expiration Date 01/24/2023	Prepared By Mohan Bera	<u>ScaleID</u> None	PipetteID METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal	
FROM	FROM 2.50000ml of M5425 + 247.30000ml of W2606 + 0.20000ml of MP73423 = Final Quantity: 250.000 ml								

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Recipe ID 1342 FROM	NAME Hg 2.5 PPB STD 2.50000ml of M5425 + 245.00000ml	<u>NO.</u> MP73426 of W2606 +	Prep Date 01/23/2023 2.50000ml of	<u>Expiration</u> <u>Date</u> 01/24/2023	Prepared By Mohan Bera inal Quantity: 25	ScaleID None	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023
Recipe ID 1343 FROM	NAME Hg 5.0 PPB STD 2.50000ml of M5425 + 242.50000ml	<u>NO.</u> <u>MP73427</u> of W2606 +	Prep Date 01/23/2023 5.00000ml of	Expiration Date 01/24/2023	Prepared By Mohan Bera inal Quantity: 25	ScaleID None	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal

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Recipe ID 1344 FROM	NAME Hg 7.5 PPB STD 2.50000ml of M5425 + 240.00000ml	<u>NO.</u> MP73428 of W2606 +	Prep Date 01/23/2023 7.50000ml of	Expiration Date 01/24/2023 MP73423 = F	Prepared By Mohan Bera inal Quantity: 25	ScaleID None	PipetteID METALS_PIP ETTE_5 (HG A)	Supervised By Sarabjit Jaswal 01/23/2023
Recipe ID 1345 FROM	NAME Hg 10.0 PPB STD 2.50000ml of M5425 + 237.50000ml	<u>NO.</u> <u>MP73429</u> of W2606 +	Prep Date 01/23/2023 10.00000ml c	Expiration Date 01/24/2023	Prepared By Mohan Bera Final Quantity: 2	<u>ScaleID</u> None 250.000 ml	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023

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Recipe ID 1346	NAME Hg ICV SOLUTION	<u>NO.</u> MP73430	Prep Date 01/23/2023	Expiration Date 01/24/2023	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
FROM	2.50000ml of M4794 + 2.50000ml of	M5425 + 24	5.00000ml of	W2606 = Fina	l Quantity: 250.	000 ml	Α)	
Recipe				Expiration	Prenared			Supervised By

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	<u>Prep Date</u>	Date	By	<u>ScaleID</u>	<u>PipetteID</u>	Sarabjit Jaswal
1351	ICB (Hg 0.00 PPB SOLUTION)	<u>MP73431</u>	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIP	0.4.400.400.000
								01/23/2023
<u>FROM</u>	2.50000ml of M5425 + 247.50000ml	of W2606 =	Final Quanti	ty: 250.000 ml			A)	

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Recipe ID 1358	NAME CCV (Hg 5.0 PPB SOLUTION)	<u>NO.</u> MP73432	Prep Date 01/23/2023	Expiration Date 01/24/2023	Prepared By Mohan Bera	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG	Sarabjit Jaswal
FROM	485.00000ml of W2606 + 5.00000ml	I of M5425 +	10.00000ml c	of MP73423 =	Final Quantity:	500.000 ml	A)	0 1720/2020
D				– • ••	- ·			a ·

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	<u>Prep Date</u>	Date	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
1352	CCB (Hg 0.00 PPB SOLUTION)	<u>MP73433</u>	01/23/2023	01/24/2023	Mohan Bera	None	METALS_PIP ETTE_5 (HG	01/23/2023
<u>FROM</u>	495.00000ml of W2606 + 5.00000ml	of M5425 =	Final Quanti	ty: 500.000 ml			A)	

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Recipe ID 1349 FROM	NAME CRA/CRI (Hg 0.2 PPB SOLUTION) 2.50000ml of M5425 + 247.30000ml	<u>NO.</u> <u>MP73434</u> of W2606 +	Prep Date 01/23/2023 0.20000ml of	Expiration Date 01/24/2023	Prepared By Mohan Bera inal Quantity: 25	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_5 (HG A)	Sarabjit Jaswal 01/23/2023
Recipe ID 1350	NAME CHK STD (Hg 7.0 PPB	<u>NO.</u> MP73435	Prep Date 01/23/2023	Expiration Date 01/24/2023	Prepared By Mohan Bera	<u>ScaleID</u> None	<u>PipettelD</u> METALS PIP	<u>Supervised By</u> Sarabjit Jaswal
FROM	2.50000ml of M5425 + 240.50000ml	of W2606 +	7.00000ml of	[•] MP73423 = F	inal Quantity: 25	50.000 ml	ETTE_5 (HG	01/23/2023

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Metals STANDARD PREPARATION LOG

Recipe ID 68 FROM	NAME STANNOUS CHLORIDE SOLUTION 450.00000ml of W2606 + 50.00000g	<u>NO.</u> <u>MP73437</u> ram of M492	Prep Date 01/23/2023 20 + 50.00000	Expiration Date 01/24/2023	Prepared By Mohan Bera	ScaleID METALS_SCA LE_3 (M SC-3) : 500.000 ml	PipettelD None	Sarabjit Jaswal 01/23/2023
ri		i						
<u>Recipe</u> <u>ID</u> 902	NAME ICP AES CAL BLK (SO/ICB/CCB)	<u>NO.</u> MP73473	Prep Date 01/24/2023	Expiration Date 02/05/2023	Prepared By Bin He	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_3 (A)	Sarabjit Jaswal

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

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<u>Recipe</u> <u>ID</u> 903	NAME ICP AES RINSE SOLN	<u>NO.</u> MP73474	Prep Date 01/24/2023	Expiration Date 02/05/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	200.00000ml of M5425 + 9800.0000	I Oml of W260	i 06 = Final Qu	antity: 10000.00	00 ml			

Recipe				Expiration	Prepared			<u>Supervised By</u>
ID	NAME	<u>NO.</u>	Prep Date	Date	By	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
904	ICP AES ICSA SOLN	<u>MP73475</u>	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	3 = Final Qua	ntity: 100.000	ml			

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Metals STANDARD PREPARATION LOG

<u>Recipe</u> <u>ID</u> 3494	NAME ICP AES ICSAB SOLN-1	<u>NO.</u> <u>MP73476</u>	Prep Date 01/24/2023	Expiration Date 02/05/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipettelD</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	0.10000ml of M4880 + 0.10000ml of 10.00000ml of M5127 + 10.00000ml	M4882 + 0. of M5220 +	10000ml of M 79.50000ml o	4939 + 0.1000 of MP73473 = 1	0ml of M5228 + Final Quantity: ↑	0.10100ml of M 100.000 ml	14589 +	
<u>Recipe</u> <u>ID</u> 907	NAME ICP AES STD S (S5)	<u>NO.</u> MP73477	Prep Date 01/24/2023	Expiration Date 02/05/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_3 (A)	Sarabjit Jaswal

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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Recipe ID 910	NAME ICP AES STD S4	<u>NO.</u> MP73478	Prep Date 01/24/2023	Expiration Date 02/05/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	100.00000ml of MP73473 + 100.000	00ml of MP7	73477 = Final	Quantity: 200.	000 ml		<u>. </u>	
Recipe				Expiration	Prepared			Supervised By

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
909	ICP AES STD S3	<u>MP73479</u>	01/24/2023	02/05/2023	Bin He	None	METALS_PIP	
							ETTE_3 (A)	01/27/2023
FROM	150.00000ml of MP73473 + 50.0000	0ml of MP73	3477 = Final	Quantity: 200.0	00 ml			
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Recipe ID 3913	NAME ICP AES STD S2	<u>NO.</u> MP73480	Prep Date 01/24/2023	Expiration Date 02/05/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	<u>PipetteID</u> METALS_PIP ETTE_3 (A)	Sarabjit Jaswal
FROM	16.00000ml of MP73477 + 184.0000	Oml of MP7:	3473 = Final (Quantity: 200.0	00 ml			
Recipe				Expiration	Prepared			Supervised By

Recipe				Expiration	Prepared			Supervised By
<u>ID</u>	NAME	<u>NO.</u>	Prep Date	<u>Date</u>	<u>By</u>	<u>ScaleID</u>	PipettelD	Sarabjit Jaswal
911	ICP AES CCV SOLN	<u>MP73481</u>	01/24/2023	02/05/2023	Bin He	None	METALS_PIP	
							ETTE_3 (A)	01/27/2023
FROM	100.00000ml of MP73473 + 100.000	00ml of MP7	73477 = Final	Quantity: 200.	000 ml			

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Metals STANDARD PREPARATION LOG

<u>Recipe</u> <u>ID</u> 3651	NAME LR CHECK 1	<u>NO.</u> MP73482	Prep Date 01/24/2023	Expiration Date 02/05/2023	<u>Prepared</u> <u>By</u> Bin He	<u>ScaleID</u> None	PipettelD METALS_PIP ETTE_3 (A)	Sarabjit Jaswal 01/27/2023	
FROM 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 9.00000ml of M4894 + 7.00000ml of MP73473 = Final Quantity: 100.000 ml									
Recipe ID 3652	NAME	<u>NO.</u> MP73483	Prep Date	Expiration Date	Prepared By Bin He	<u>ScaleID</u> None	<u>PipettelD</u>	<u>Supervised By</u> Sarabjit Jaswal	

ETTE_3 (A)

01/27/2023

FROM 10.0000ml 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				Expiration	Prepared			Supervised By
ID	NAME	<u>NO.</u>	Prep Date	Date	By	<u>ScaleID</u>	PipetteID	Sarabjit Jaswal
2951	ICP AES S1/CRI WORK STD	<u>MP73484</u>	01/24/2023	02/05/2023	Bin He	None	METALS_PIP ETTE_3 (A)	01/27/2023
<u>FROM</u>	196.00000ml of MP73473 + 4.00000	ml of MP73	192 = Final Q	uantity: 200.00	0 ml			
<u>Recipe</u> <u>ID</u> 912	NAME ICP AES ICV SOLN	<u>NO.</u> <u>MP73485</u>	Prep Date 01/24/2023	Expiration Date 02/05/2023	Prepared By Bin He	<u>ScaleID</u> None	PipetteID METALS_PIP	<u>Supervised By</u> Sarabjit Jaswal
							ETTE_3 (A)	01/27/2023

01/27/2023

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



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CHEMICAL RECEIPT LOG BOOK

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 #
Seidler Chemical	BA-3238-05 / Potassium Persulfate (2.5kg)	0000234156	08/06/2025	07/23/2019 /	07/25/2019 / manojkumar	M4465
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	Z9651Q / CHEM-CLP-4/.25L	R2-MEB694243	06/29/2024	07/13/2020 / bin	07/02/2020 / bin	M4589
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58024 / Chromium, Cr, 500 ml, 1000 PPM	082620	08/26/2023	11/11/2020 / bin	10/28/2020 / bin	M4657
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	/ Nickel (Ni) 1000PPM	072420	07/24/2023	02/26/2021 / BIN	10/28/2020 / BIN	M4768



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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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	57004 / Be, 1000 PPM, 125 ml	030221	03/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4876
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #_
Absolute Standards, Inc.	57048 / Cd, 1000 PPM, 125 ml	072821	07/28/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4877



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CHEMICAL RECEIPT LOG BOOK

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 Opened /	Received Date /	Chemtech
Absolute Standards, Inc.	57016 / S, 1000 PPM, 125 ml	051721	05/17/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4882
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57034 / Se, 1000 PPM, 125 ml	070221	07/02/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4883
Supplier	ItemCode / ItemName	Lot #	Expiration	Date Opened /	Received Date /	Chemtech
Absolute Standards, Inc.	57014 / Si, 1000 PPM, 125 ml	030921	03/09/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	Lot # M4884



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57047 / Ag, 1000 PPM, 125 ml	072921	07/29/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4885
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57050 / Sn, 1000 PPM, 125 ml	021121	02/11/2024	08/05/2021 / jaswal	08/05/2021 / jaswal	M4886
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57022 / Ti, 1000 PPM, 125 ml	070721	07/07/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4888
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	57081 / TI, 1000 PPM, 125 ml	073021	07/30/2024	08/06/2021 / jaswal	08/05/2021 / jaswal	M4889
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58030 / Zinc, Zn, 500 ml, 1000 PPM	031921	03/19/2024	08/25/2021 / bin	08/05/2021 / jaswal	M4891
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58126 / Fe, 10000 PPM, 500 ml	061021	06/10/2024	07/26/2021 /	06/25/2021 /	M4894



CHEMICAL RECEIPT LOG BOOK

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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	57003 / Li, 1000 PPM, 125 ml	030221	03/02/2024	09/23/2021 / bin	09/22/2021 / bin	M4939

Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CGIN10-5 / INDIUM 1 x 500 ml	100721	10/07/2024	10/09/2021 / jaswal	10/08/2021 / jaswal	M4960



Standards, Inc.

500 ml

CHEMICAL RECEIPT LOG BOOK

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 #
Absolute	58120 / Ca, 10000 PPM,	082021	08/20/2024	12/05/2021 /	10/05/2021 /	

bin

bin

M5108



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 / Received By	Chemtech Lot #
Absolute Standards, Inc.	58111 / Na, 10000 PPM, 500 ml	092121	09/21/2024	06/23/2022 / bin	10/05/2021 / bin	M5200
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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 / Received By	Chemtech Lot #
Seidler Chemical	BA-9673-33 / Sulfuric Acid, Instra-Analyzed (cs/6c2.5L)	22D0862014	01/20/2025	08/22/2022 /	04/26/2022 / mohan	M5211



Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Inorganic Ventures	CHEM-QC-4 / CHEM-QC-4, Second Source, 1000 ug/ml, B, Mo, Si, Sn, Ti	S2-MEB711674	07/01/2024	07/01/2022 / bin	09/10/2021 / bin	M5218
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
EPA	PART B / ICSAB (ICP) STOCK SOLN	ICSB-0710	04/26/2023	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 Opened /	Received Date /	Chemtech

	iveu by LOT #	
11/27/2022 / 07/05 swal bin	5/2022 / M5228	
2 1 S	1/27/2022 / 07/05 wal bin	I/27/2022 / wal 07/05/2022 / bin M5228



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	03/03/2023	09/12/2022 / Al-Terek	04/11/2022 / Al-Terek	M5280
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
Absolute Standards, Inc.	58113 / Aluminum (Al) 10,000PPM	070622	07/06/2025	09/02/2022 / jaswal	07/12/2022 / jaswal	M5289
Supplier	ItemCode / ItemName	Lot #	Expiration Date	Date Opened / Opened By	Received Date / Received By	Chemtech Lot #
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 Opened /	Received Date /	Chemtech
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	Lot # 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 #
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	12/28/2022 / Al-Terek	01/28/2022 / Al-Terek	M5411
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-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 / 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	BA-9598-34 / Nitric Acid, Instra-Analyzed (cs/4x2.5L)	22C0462001	07/11/2023	1	02/11/2022 / Al-Terek	M5426
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

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

1.116 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods Certified Value, X _{CRM/RM} , where two or more methods of characterization are used is the weighted mean of the results:	Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results:
$\begin{split} \textbf{X}_{\textbf{CRM/RM}} &= \Sigma(\textbf{w}_i) ~ (\textbf{X}_i) \\ \textbf{X}_i &= \text{mean of Assay Method i with standard uncertainty u_{char i} \\ \textbf{w}_i &= \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ \textbf{w}_i &= (1/u_{char})^2 / (\Sigma(1/(u_{char})^2)) \end{split}$	$X_{CRM/RM} = (X_a) (u_{char a})$ $X_a =$ mean of Assay Method A with $u_{char a} =$ the standard uncertainty of characterization Method A
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{char} + u^2_{bb} + u^2_{1ts} + u^2_{ts}$) ^{1/2} k = coverage factor = 2 $u_{char} = [\Sigma((w_i)^2 (u_{char})^2)]^{1/2}$ where u_{char} i are the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{ts} = transport stability standard uncertainty	$\begin{split} & CRM/RM\ Expanded\ Uncertainty\ (\pm) = U_{\mathsf{CRM/RM\ } = k\ (u^2_{\ char\ a} + u^2_{\ bb} + u^2_{\ its} + u^2_{\ ts})^{V_2}} \\ & k = coverage\ factor = 2 \\ & u_{char\ a} = the\ errors\ from\ characterization \\ & u_{bb\ } = bottle\ to\ bottle\ homogeneity\ standard\ uncertainty \\ & u_{lts\ } = long\ term\ stability\ standard\ uncertainty \\ & u_{ts\ } = transport\ stability\ standard\ uncertainty \end{split}$
ACEABILITY TO NIST	

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 14, 2020

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

11.2 Lot Expiration Date

- February 14, 2024

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Manager, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines CEO, Senior Technical Director

Prul R Line



Certificate of Analysis

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

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

Density:

1.043 g/mL (measured at 20 \pm 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
As	ICP Assay	3103a	100818
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Se	ICP Assay	3149	100901
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 Certified Value, X _{CRM/RM} , where two or more methods of characterization are used is the weighted mean of the results:	Characterization of CRM/RM by One Method Certified Value, X _{CRM/RM} , where one method of characterization is used is the mean of individual results:
$\begin{split} \textbf{X}_{\textbf{CRM/RM}} &= \Sigma(\textbf{w}_i) ~ (\textbf{X}_i) \\ \textbf{X}_i &= \text{mean of Assay Method i with standard uncertainty u_{char i} \\ \textbf{w}_i &= \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ \textbf{w}_i &= (1/u_{char i})^2 / (\Sigma(1/(u_{char i})^2)) \end{split}$	$X_{CRM/RM} = (X_a) (u_{char a})$ $X_a = mean of Assay Method A withu_{char a} = the standard uncertainty of characterization Method A$
CRM/RM Expanded Uncertainty (±) = U _{CRM/RM} = k ($u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts}$) ^{1/2} k = coverage factor = 2 $u_{char} = [\Sigma[(w_i)^2 (u_{char} i)^2]$) ^{1/2} where u_{char} i are the errors from each characterization method u_{bb} = bottle to bottle homogeneity standard uncertainty u_{lts} = long term stability standard uncertainty (storage) u_{ts} = transport stability standard uncertainty	$ \begin{array}{l} \mbox{CRM/RM Expanded Uncertainty (±) = U_{\mbox{CRM/RM}} = k \left(u^2_{\mbox{char a}} + u^2_{\mbox{bb}} + u^2_{\mbox{lts}} + u^2_{\mbox{ts}} \right)^{1/2} \\ \mbox{k = coverage factor = 2$} \\ \mbox{$u_{\mbox{char a}} = the errors from characterization$} \\ \mbox{$u_{\mbox{bb}} = bottle to bottle homogeneity standard uncertainty$} \\ \mbox{$u_{\mbox{ts}} = bottle to bottle homogeneity standard uncertainty$} \\ \mbox{$u_{\mbox{ts}} = transport stability standard uncertainty$} \\ \mbox{$u_{\mbox{ts}} = transport stability standard uncertainty$} \end{array} $
ACEABILITY TO NIST	

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 13, 2022

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

11.2 Lot Expiration Date

- January 13, 2027

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski Manager, Quality Control

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

SD978Ci Paul R Saines

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,

Specification	Result
>= 99.0 %	100.3
5.0 - 9.0	6.0
<= 0.005 %	< 0.001
<= 0.002 %	< 0.002
<= 0.01 %	< 0.01
<= 0.003 %	< 0.001
<= 5 ppm	< 5
<= 0.004 %	< 0.004
Passes Test	РТ
<= 5 ppm	< 5
<= 2 ppm	< 2
<= 0.002 %	< 0.001
<= 0.001 %	< 0.001
<= 0.005 %	0.002
	Specification >= 99.0 % 5.0 - 9.0 <= 0.005 % <= 0.002 % <= 0.003 % <= 5 ppm <= 0.004 % Passes Test <= 5 ppm <= 2 ppm <= 0.002 % <= 0.001 % <= 0.001 % <= 0.005 %

For Laboratory, Research or Manufacturing Use Meets Reagent Specifications for testing USP/NF monographs

Country of Origin: US Packaging Site: Paris Mfg Ctr & DC

mes Techie

Jamie Ethier Vice President Global Quality

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

M4371

Hydroxylamine Hydrochloride, Crystal BAKER ANALYZED® A.C.S. Reagent Suitable for Mercury Determination (hydroxylammonium chloride)

Rec - 06.07.12



avantor

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 SO4)	<= 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

James Techie

Jamie Ethier Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.386.1700 Avantor Performance Materials, LLC 100 Matsonford Rd, Suite 200, Radnor, PA 19087. U.S.A. Phone: 610.386.1700 M4589 R:7/2/2020 BH



CERTIFICATE OF ANALYSIS

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution	on
Catalog Number:	CHEM-CLP-4	
Lot Number:	R2-MEB694243	
Matrix:	3% (v/v) HNO3 3% (v/v) HF	
Value / Analyte(s):	1 000 μg/mL ea: Boron, Silicon, Titanium	Molybdenum, Tin,

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 7 μg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 5 µg/mL
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 5 μg/mL
Titanium, Ti	1 000 ± 7 μg/mL		

Density:

1.031 g/mL (measured at 20 \pm 4 °C)

Assay Information:

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

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

Characterization of CRM/RM by Two or More Methods Characterization of CRM/RM by One Method Certified Value, X_{CRM/RM}, where two or more methods of characterization are Certified Value, $X_{CRM/RM}$, where one method of characterization used is the weighted mean of the results: is used is the mean of individual results: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char a})$ X_i = mean of Assay Method i with standard uncertainty $u_{char i}$ X_a = mean of Assay Method A with **w**_i = the weighting factors for each method calculated using the inverse square of uchar a = the standard uncertainty of characterization Method A the variance $w_i = (1/u_{char_i})^2 / (\Sigma(1/(u_{char_i})^2))$ CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²_{char} + u²_{bb} + u²_{lts} + u²_{ts})^{1/2} CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum_{i} ((w_i)^2 (u_{char})^2)\right]^{\frac{1}{2}}$ where u_{char} i are the errors from each characterization method uchar a = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty ubb = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) ults = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 29, 2020

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

11.2 Lot Expiration Date

- June 29, 2024
- The date after which this CRM/RM should not be used.

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

11.3 Period of Validity

- Sealed TCT Bag Open Date: ____

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line

bsolute Standards, Inc. 0-368-1131 ww.absolutestandards.com	<			C	Certified I	Reference	Material CR	RM .	5	h	ANAB ISO 17034 AR-1539 Certifica ttps://Absolutestan	AB ISO 17034 Accredite I-1539 Certificate Numb :://Absolutestandards.co		
ERTIFIED WEIGHT REPORT:						Lot #	Solvent:							
Part Number:		58024				19410105	Nitric Acid			N				
Lot Number:		082620							Can	me Dan	7			
Description:		Chromium	ı (Cr)							\subset				
						2.0%	40.0	Nitric Acid	Formulated By:	Lawrence Ba	arry 08262	20		
Expiration Date: 082623							(mL)		1	\wedge				
Recommended Storage:		Ambient (20	°C)						4.	A				
Nominal Concentration (µg/mL):		1000							pena	Jento				
NIST Test Number:		23060		5E-05	Balance Uncer	tainty			Reviewed By:	Pedro L. Renta	as 08262	20		
Volume shown below v	as dilute	ed to (mL):	2000.02	0.058	Flask Uncertai	nty		•						
									Expanded	SDS Info	rmation			
	Part	Part Lot Dilution		ution Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solvent Safety Info	. On Attached pg.)	NIST		
Compound	Number	Number	Factor	Vol. (mL)	Pipette	Conc. ($\mu \alpha/mL$)	Conc. $(\mu q/mL)$	Conc. (ua/mL)	$+/-(\mu a/mL)$ (AS# OSHA PEL (T)	NA) LD50	SRM		





							Trace M	etals	s Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	< 0.02	Ca	< 0.2	Er	< 0.02	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	Т	Ga	< 0.02	Fe	<0.2	Hg	<0.2	Р	< 0.02	Ru	< 0.02	Sr	<0.02	Tm	<0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Мо	<0.02	Pt	< 0.02	Sm	< 0.02	S	<0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	<0.02	K	<0.2	Sc	< 0.02	Та	<0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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

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

- * 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).

Br. P. An

Part # 57028 www.absolutestandards.com 800-368-1131 CERTIFIED WEIGHT REPORT: Absolute Standards, Inc. 1. Nickel (II) nitrate Hexahydrate (Ni) Compound 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): Lot # 072420 **NIST Test Number:** Expiration Date: Part Number: Description: Lot Number: [1] Spectrum No.1 210 110 10 58128 Number Part 8944 W 23060 57028 072420 1000 Ambient (20 °C) 072423 082719 Nickel (Ni) Number 220 120 Lot NO -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 Initial Certified Reference Material CRM Flask Uncertainty Balance Uncertainty 240 Uncertainty 140 0.013 40 R 0/28/2020 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 60 Conc. (µg/mL) Nitric Acid 1000.0 Final 170 NO Formulated By: Reviewed By: +/- (µg/mL) Uncertainty Expanded 2.0 Lamonue 180 80 s 13478-00-7 CAS# (Solvent Safety Info. On Attached pg.) OSHA PEL (TWA) Pedro L. Rentas 190 ento Lawrence Barry 90 SDS Information 1 mg/m3 S https://Absolutestandards.com ANAB ISO 17034 Accredited AR-1539 Certificate Number 200 100 orl-rat 1620 mg/kg LD50 072420 072420 3136 NIST SRM

1 of 2

Printed: 7/29/2020, 11:15:07 PM

00-368-1131	Absolute Standards, I
	Inc.





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

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

e	ਸ਼ !	<u>B</u> !	Be	Ба	n As	100	ç	AI			
70.02	20.02	<0.02	<0.01	<0.02	<0.2	10.02	2002	< 0.02	No. of the other states of the		
	2	C,	G	U's	6		5	Cd	Concession of the		
50.02	-0.02	c0 02	< 0.02	< 0.02	<0.02	2.02	- CO	c0.0>	A STATE OF A		
Au		C.	Ga	Gd	Eu	1 1	7 5	Dv			
<0.02	-0.02	~~~~	<0.02	< 0.02	<0.02	<0.02	-0.02	0.02			
Pb	2 5	-	Fe	lr	In	Но		Ηf			
<0.02	<0.02	10.02	<0.2	< 0.02	<0.02	<0.02	~0.02	007	Contraction of the second	I race M	
Nd	OIAI		Hα	Mn	Mg	Lu			Contraction of the	letals	
<0.02	<0.02		< 0 2	<0.02	<0.01	< 0.02	<0.02	-0 m	ATTENDED TO A	Verifica	
×	7		p	Pd	Os	Nb	N			tion	
<0.2	<0.02	10.0L	c0 02	< 0.02	< 0.02	< 0.02	-	,		by ICP-N	
Sc	Sm	, N	P.	Rb	Rh	Re	Ч	,		in) SI	
<0.02	<0.02	10.02	c0 02	< 0.02	<0.02	< 0.02	<0.02			g/mL)	
Ta	s	S	0	Na	Ag	Si	Se				
<0.02	<0.02	50.02	50 02	<0.2	< 0.02	< 0.02	<0.2				
Ti	Sn	Im		Th	T	Te	Ть				
< 0.02	< 0.02	<0.02	2	<0.02	< 0.02	< 0.02	< 0.02				
Zr	Zn	Y	< ;	۲h	<	U	W				
<0.02	<0.02	<0.02	0.02	<0.02	<0.02	< 0.02	<0.02				

(T)= Target analyte

Physical Characterization:

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

In P. Star

Certified by:

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

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

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

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

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

Part # 57028

R: 04/20/21 QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY

"An ISO 9001:2015 Certified Program"

APTIM

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.

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

CAUTION:

M4791 M4792 M4793 M4794 M4794 M4791 M4791 M4791

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

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 μ 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).

For ICP-AES analysis, use a 10-fold dilution by pipetting 10 mL of the ICV1 ICV1-1014 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

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



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

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

ICV1-1014								
Concentration (µg/L) (after 10-fold dilution)	Concentration (µg/L) (after 50-fold dilution)							
2500	500							
1000	200							
1000	200							
520	100							
510	100							
510	100							
10000	2000							
520	100							
520	100							
520	100							
510	2000							
10000	200							
1000	1200							
6000	100							
520	110							
530	110							
9900	2000							
1000	200							
250	50							
10000	2000							
1000	210							
500	100							
1000	200							
	ICV1-1014 Concentration (μg/L) (after 10-fold dilution) 2500 1000 520 510 510 10000 520 520 520 520 520 520 520							

	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					





							Trace M	etals	· Verifica	tion	by ICP-M	S (µ	g/mL)						
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Но	< 0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	<0.01	Os	< 0.02	Rh	<0.02	Ag	< 0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	< 0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	<0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	< 0.02	Fe	<0.2	Hg	<0.2	Р	< 0.02	Ru	<0.02	Sr	< 0.02	Tm	< 0.02	Y	<0.02
Bi	< 0.02	Co	Т	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:

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 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 WEIGHT REPORT:								https://	Absolutestand	ards.com
				Lot #						
Part Number: <u>5718</u> Lot Number: <u>0323</u> Description: Lead	<u>2</u> <u>21</u> (Pb)		Solvent:	20370011	Nitric Acid		Aa	mome Bang	-	
· · · · ·			2%	40.0	Nitric Acid		Formulated By:	Lawrence Barry	032321	
Expiration Date: 0323	24			(mL)			1	\land		
Recommended Storage: Ambi	ent (20 °C)						4	1. Nonto	-	
Nominal Concentration (μg/mL): 1000 NIST Test Number: 6UTE	0	5E-05 Balance U	Incertainty				Reviewed By:	Pedro L. Rentas	032321	
Weight shown below was diluted to	(mL): 2000.02	0.058 Flask Und	ertainty							-
							Expanded	SDS Informati	on	
	ot Nominal	Purity Uncertai	nty Assay	Target	Actual	Actual	Uncertainty	(Solvent Safety Info. On Al	tached pg.)	NIST
Compound RM# Nur	nber Conc. (µg/mL	.) (%) Purity (%) (%)	Weight (g)	Weight (g)	Conc. (µg/mL)	+/- (μg/mL) CA	AS# OSHA PEL (TWA)	LD50	SRM





						-	Trace Me	tals	S Verifica	tion	by ICP-N	4S (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	Р	< 0.02	Ru	<0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	<0.02	Pt	< 0.02	Sm	<0.02	S	< 0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	Т	Nd	<0.02	K	< 0.2	Sc	< 0.02	Та	< 0.02	Ti	<0.02	Zr	< 0.02

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Certified by:

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com			C	Certified F	Reference l	Material CF	RM			AN/ AR https	AB ISO 17034 A -1539 Certificate ://Absolutestand	Accredit e Numb lards.co
CERTIFIED WEIGHT REPORT:					Lot #	Solvent:						
Part Number:	57033				19410105	Nitric Acid			^	N		
Lot Number:	012521							CTE	anone	Dang		
Description:	Arsenic (A	<u>s)</u>										
					2.0%	40.0	Nitric Acid	Formulated By	y:	Lawrence Barry	012521	
Expiration Date:	012524					(mL)			7	\wedge		
Recommended Storage:	Ambient (20	°C)						4	· · · ·	the second		
Nominal Concentration (µg/mL):	1000							pen	5	cento -		
NIST Test Number:	23060		5E-05	Balance Uncert	tainty			Reviewed By:		Pedro L. Rentas	012521	
Volume shown below was dilute	d to (mL):	2000.02	0.058	Flask Uncertair	nty		•					_
								Expanded		SDS Informa	tion	
Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On A	Attached pg.)	NIST
Compound Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1. Arsenic (As) 58133	092220	0.1000	200.0	0.084	1000	10001.0	1000.0	2.2	7440-38-2	0.2 mg/m3	orl-rat 763 mg/kg	3103a





							Trace M	etals	S Verifica	tion	by ICP-M	S (µ	g/mL)						
4.1	0.02		0.00	D	0.02	TIC	0.02		0.02	- N.T.	0.02	D	0.02	a	0.0	771	0.02	XX 7	0.00
AI	<0.02	Cd	<0.02	Dy	<0.02	Ht	<0.02	Lı	<0.02	N1	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	w	<0.02
Sb	< 0.02	Ca	<0.2	Er	<0.02	Но	< 0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	Т	Ce	< 0.02	Eu	<0.02	In	< 0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	< 0.02	T1	< 0.02	V	< 0.02
Ba	<0.02	Cs	< 0.02	Gd	< 0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	< 0.02	Na	<0.2	Th	<0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	< 0.02	Fe	<0.2	Hg	<0.2	Р	<0.02	Ru	< 0.02	Sr	<0.02	Tm	<0.02	Y	< 0.02
Bi	<0.02	Co	< 0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	<0.02	Pb	< 0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Та	<0.02	Ti	< 0.02	Zr	< 0.02

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	4			C	Certified	Reference	Material CF	RM			AN/ AR https:	AB ISO 17034 A -1539 Certificat //Absolutestanc	Accredit e Numb lards.co
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number	:	<u>57004</u>				19410105	Nitric Acid			7	R		
Lot Number		030221							Cha	mone	Dang		
Description		Beryllium	(Be)								\bigcirc		
						2.0%	40.0	Nitric Acid	Formulated By	:	Lawrence Barry	030221	
Expiration Date	:	030224					(mL)			7	\wedge		
Recommended Storage	:	Ambient (20) °C)						4	1 7	the state		
Nominal Concentration (µg/mL)	:	1000							Jun		ento		
NIST Test Number	:	23060		5E-05	Balance Unce	rtainty			Reviewed By:		Pedro L. Rentas	030221	
Volume shown below	was dilut	ed to (mL):	2000.02	0.058	Flask Uncerta	inty							_
									Expanded		SDS Information	tion	
	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	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1 Bervllium acetate basic (Be)	58104	063020	0 1000	200.0	0 084	1000	10000 1	1000.0	22	19049-40-2	0 002 mg/m3	orl-rat 28 mg/kg	3105a





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

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Certified by:

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	Ś			(Certified	Reference	Material CF	RM			AN AF https	AB ISO 17034 A R-1539 Certificate :://Absolutestand	ccredited Number ards.com
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						_
Part Number:		<u>57048</u>				20370011	Nitric Acid		al a	<u>a</u> p	(. to	b	
Lot Number:		<u>072821</u>							Hior	anne	esposito		
Description:		Cadmium	<u>(Ca)</u>			2.0%	40.0	Nitrio Aoid	Eormulated B		Ciovonni Eonocito	070901	
Expiration Date:		072824				2.0%	40.0 (ml.)	Millic Aciu	Formulated D	y.		072821	
Recommended Storage:		Ambient (20) °C)				()			- - -	h		
Nominal Concentration (μ g/mL):		1000	- /						Ken	6	lento		
NIST Test Number:		6UTB		5E-05	Balance Unce	rtainty			Reviewed By		Pedro L. Rentas	072821	
Volume shown below w	vas dilut	ed to (mL):	2000.02	0.058	Flask Uncertai	nty							-
									Expanded		SDS Informa	ation	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solve	nt Safety Info. Or	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. Cadmium nitrate tetrahydrate (Cd)	58148	010920	0.1000	200.0	0.084	1000	10000.5	1000.0	2.2	10022-68-1	0.2 mg/m3	orl-rat 300 mg/kg	3108
[1] Specti	rum N	lo.1 [:	33.363 s	sec]:57	048.D#	Count] [Li	inear]						
2.0E8													
1.0E8-													





							Trace M	etals	S Verifica	tion	by ICP-M	IS (µ	g/mL)						
Δ1	<0.02	Cd	Т	Dv	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<02	Th	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Но	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	<0.02	Eu	<0.02	In	< 0.02	Mg	<0.01	Os	<0.02	Rh	< 0.02	Ag	<0.02	Tl	< 0.02	v	<0.02
Ba	< 0.02	Cs	<0.02	Gd	<0.02	Ir	< 0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	< 0.02	Yb	<0.02
Be	< 0.01	Cr	<0.02	Ga	<0.02	Fe	< 0.2	Hg	<0.2	Р	<0.02	Ru	<0.02	Sr	< 0.02	Tm	< 0.02	Y	<0.02
Bi	< 0.02	Co	< 0.02	Ge	< 0.02	La	< 0.02	Mo	<0.02	Pt	<0.02	Sm	< 0.02	S	<0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	< 0.02	Та	< 0.02	Ti	< 0.02	Zr	< 0.02

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AUSOIULE Statiual C 300-368-1131 www.absolutestandards.cc	CERTIFIED WEIGHT REPOR	Par Loi De	Expir	Recommende	Nominal Concentratic	NIST Tes	Volume sho		Compound	1. Ammonium molybdate (N	2.005	1.0E5	m/z->	2000	1000	m/z-> 2.0E6	1.0E6	m/z->
' IS, INC.	Ð	t Number: Number: scription:	ation Date:	d Storage:	on (µg/mL):	st Number:	wn below w			10)								61
		N 10 15	0	2	10	6	as diluted	Dart	Number	58142			10			10		210
		7 <u>042</u> 7 <u>2821</u> olvbdenu	2824	nbient (20	000	JTB	to (mL):	2	Number	042220			20			120		NNO
		m (Mo)		Ċ			2000.02	Dilution	Factor	0.1000								
						5E-05	0.058		Vol. (mL)	200.0			30			130		230
Certified						Balance Uncer	Flask Uncertai	Incertainty	Pipette (mL)	0.084			40			140		240
Referen My S	Lot #	MKBQ8597	0.5%			tainty	nty	Nominal	Conc. (µg/m	1000			(h					N
ce Mate	Solv	V Ammoni	á 1	4				ī.	L) Conc. (100			ŏ			50		50
	ent:	um hydroxide	.0 Ang	1				3	ug/mL) Cor	90.9			60			160		260
82.	-	Ø	nonium hydroxide			0		<u>.</u>	nc. (µg/mL)	1000.0			2			-		
12		A.	Formulated	M	100	Reviewed E	1		+/- (µg/mL	2.2			Ó			70		
		varrie	By:		0.	Зу:) CAS	13106-			80			180		
		C2	Giova	af .		Pedro	2	(Solvent Ca	(JOIVEILL JA	76-8 5 m			99			0 L		
http		inter	nni Esposito			L. Rentas		fatu Info D	A PEL (TWA)	ıg(Mo)/m3		al and some to be made to see	U			ŏ		
VAB ISO R-1539 C s://Absolu		~		'				attochad		orl-rat 3			100			200		
17034 A Sertificate utestand			072821			072821		2	D20	33 mg/kg								
ecredita Numb ards.co								NICT	SRM	3134								

Part # 57042 Lot # 072821

1 of 2

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www.absolutestandards.com	300-368-1131	Absolute Standards,
		Inc.



Certified Reference Material CRM



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

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

B	Bi	Be	Ba	As	Sb	AI			
<0.02	<0.02	<0.01	<0.02	<0.2	<0.02	<0.02			
Cu	C ₀	Ω	Cs	Çe	Ca	Cd			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02			
Au	Ge	Ga	Gd	Eu	Ę	Dy			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
РЪ	La	Fe	١٢	ľn	Но	Hf			
<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	the function of the second	Trace M	
Nd	Mo	Hg	Mn	Mg	L	Ľ		etals	
<0.02	Т	<0.2	<0.02	<0.01	<0.02	<0.02		Ventica	
к	Ŗ	P	Pd	Os	NP	Ņ		tion	-
<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		by ICP-M	
Sc	Sm	Ru	Rb	Rh	Re	Pr		SII) S	>
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	Sector States and the sector sector		
Ta	s	Sr	Na	Ag	Si	Se			
<0.02	<0.02	<0.02	40.2	<0.02	<0.02	<0.2	and the second second second		
Ti	Sn	Tm	Π	П	Te	ТЪ			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Zr	Zn	Y	ΥЪ	<	C	W	Same and the		
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	いたい しょうかんない いいいい		

(T)= Target analyte

Physical Characterization:

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

In 1. All

Certified by:

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

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

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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 # 57042 Lot # 072821





							Trace M	etals	S Verifica	tion	by ICP-M	S (µ	g/mL)						
A1	<0.02	Cd	<0.02	Dv	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<02	Th	<0.02	W	<0.02
Sb	<0.02	Ca	<0.2	Er	<0.02	Но	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U	<0.02
As	<0.2	Ce	< 0.02	Eu	<0.02	In	< 0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	< 0.02	Tl	<0.02	v	<0.02
Ba	<0.02	Cs	< 0.02	Gd	<0.02	Ir	< 0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	Т	Ru	< 0.02	Sr	< 0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	< 0.02	Ge	<0.02	La	< 0.02	Мо	<0.02	Pt	<0.02	Sm	<0.02	S	< 0.02	Sn	<0.02	Zn	<0.02
В	< 0.02	Cu	< 0.02	Au	<0.02	Pb	< 0.02	Nd	<0.02	K	<0.2	Sc	< 0.02	Та	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	4			C	Certified I	Reference	Material CF			AN AF https	AB ISO 17034 R-1539 Certific s://Absolutesta	Accredit ate Numb ndards.co	
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number:		57082				20370011	Nitric Acid				VI		
Lot Number:							Cta	unme	Dang	-			
Description:		Lead (Pb)									\bigcirc		
					2.0%	40.0	Nitric Acid	Formulated By	:	Lawrence Barry	062	221	
Expiration Date:	Expiration Date: 062224						(mL)			7	\wedge		
Recommended Storage:		Ambient (20	°C)							1. 7	Po to	_	
Nominal Concentration (µg/mL):		1000							Jen		ento		
NIST Test Number:		6UTB		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	062	221
Volume shown below v	vas dilute	ed to (mL):	2000.02	0.058	Flask Uncertai	nty							
									Expanded		SDS Information	ation	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On	Attached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1 Lood (II) Nitrata (Db)	50100	020201	0 1000	200.0	0.094	1000	10000 1	1000.0	2.2	10000 74 9	$0.05 mg/m^{2}$	intrune rat 02 mg	/kg 2100





	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	Р	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	< 0.02	Со	< 0.02	Ge	<0.02	La	<0.02	Мо	<0.02	Pt	<0.02	Sm	<0.02	S	< 0.02	Sn	<0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	< 0.02	Pb	Т	Nd	<0.02	K	<0.2	Sc	<0.02	Та	< 0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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

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	Trace 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	Ho	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	< 0.02	U	<0.02
As	<0.2	Ce	< 0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	Tl	< 0.02	V	<0.02
Ba	<0.02	Cs	< 0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	< 0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	<0.02	Ge	<0.02	La	<0.02	Мо	<0.02	Pt	<0.02	Sm	<0.02	S	Т	Sn	< 0.02	Zn	<0.02
В	< 0.02	Cu	< 0.02	Au	<0.02	Pb	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Та	<0.02	Ti	<0.02	Zr	<0.02

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	4			C	Certified I	Reference	Material CF	RM		Þ	AN AF https	AB ISO 17034 A -1539 Certificate ://Absolutestand	ccredited Numbe ards.con
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number	:	<u>57034</u>				20370011	Nitric Acid		al .	æ	C +		1
Lot Number	:	070221							Liova	nne	esposito		
Description	:	Selenium	<u>(Se)</u>								L		
						2.0%	40.0	Nitric Acid	Formulated By	:	Giovanni Esposito	070221	
Expiration Date		070224					(mL)			7	\wedge		
Recommended Storage	:	Ambient (20) °C)							1, -	Rot		
Nominal Concentration (µg/mL)	:	1000							- Man		into		
NIST Test Number	:	6UTB		5E-05	Balance Uncer	tainty			Reviewed By:		Pedro L. Rentas	070221	
Volume shown below	was dilut	ed to (mL):	2000.02	0.058	Flask Uncertai	nty							-
									Expanded		SDS Informa	tion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Sol	vent Safety Info. On	Attached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1 Selenium(IV) oxide (Se)	58134	021621	0.1000	200.0	0.084	1000	10000.2	1000.0	2.2	7446-08-4	0.2 ma/m3	orl-rat 68 ma/ka	3149





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

(T)= Target analyte

Physical Characterization:

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

Bort. All

Certified by:

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	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	Т	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	<0.02	In	< 0.02	Mg	<0.01	Os	< 0.02	Rh	<0.02	Ag	<0.02	Tl	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	<0.02	Ir	< 0.02	Mn	< 0.02	Pd	< 0.02	Rb	<0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	<0.02	Fe	<0.2	Hg	< 0.2	Р	< 0.02	Ru	<0.02	Sr	<0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	<0.02	La	< 0.02	Мо	< 0.02	Pt	< 0.02	Sm	<0.02	S	<0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	<0.02	Pb	< 0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Та	<0.02	Ti	< 0.02	Zr	< 0.02

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Ab 300 wwv	Solute Standards, Inc. J-368-1131 w.absolutestandards.com	4			C	Certified R	leference	Material CF	RM			AN AF https	AB ISO 17034 A R-1539 Certificat s://Absolutestanc	Accredit e Numt dards.co
CEF	RTIFIED WEIGHT REPORT: Part Number Lot Number Description		57047 072921 Silver (Ag)				Lot # 20370011	Solvent: Nitric Acid		Hioro	nni '	Esposito	Þ]
	Expiration Date Recommended Storage Nominal Concentration (µg/mL):	072924 Ambient (20 1000	•C)			2.0%	40.0 (mL)	Nitric Acid	Formulated By	1: 1	Giovanni Esposito	07292	
	NIST Test Number Volume shown below	was dilut Part	6UTB ed to (mL):	2000.02 Dilution	5E-05 0.058 Initial	Balance Uncertain Flask Uncertain Uncertainty	ainty ty Nominal	Initial	Final	Expanded Uncertainty	(Sol	SDS Information Official States SDS Information Official States (States States	07292 ation Attached pg.)	NIST
•	Silver pitrete (Ag)	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	7761 99 9	10 ug/m2	LD50	
	2000-													
	m/z->	10	20	30	<u> </u>	40	50	60		0	BO	90	100	
	2.5E5-			· · · · ·										
	m/z-> 1	10	120	13	0	140	150	160	17	'O 1	80	190	200	
	2.5E6-													
	m/z->	10	220	23	0	240	250	260						



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

(T)= Target analyte

Physical Characterization:

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

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https: | AB ISO 17034 /
-1539 Certificat
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te Number
dards.com |
|---|------------|-----------------|----------|-----------|----------------|---------------|---------------|-------------------|---------------|------------|--|---|--------------------------------------|
| CERTIFIED WEIGHT REPORT: | | | | | | Lot # | Solvent: | | | | | | |
| Part Number: | | 57050 | | | | 19410105 | Nitric Acid | | | 7 | N | | |
| Lot Number: | | 021121 | | | | 240241 | Hydrochloric | acid | CA | mone | Dang | | |
| Description: | | <u>Tin (Sn)</u> | | | | | | | | | \square | | |
| | | | | | | 2.0% | 40.0 | Nitric Acid | Formulated By | : | Lawrence Barry | 02112 | 1 |
| Expiration Date: | | 021124 | | | | 6.0% | 120.0 | Hydrochloric acid | | , | \wedge | | |
| Recommended Storage: | | Ambient (20 | °C) | | | | (mL) | | 4 | , 7 | Provent in the second s | | |
| Nominal Concentration (µg/mL): | | 1000 | | | | | | | pen | 6 | ento | | |
| NIST Test Number: | | 23060 | | 5E-05 | Balance Uncer | tainty | | | Reviewed By: | | Pedro L. Rentas | 02112 | 1 |
| Volume shown below v | vas dilute | ed to (mL): | 1999.78 | 0.265 | Flask Uncertai | nty | | • | | | | | |
| | | | | | | | | | Expanded | | SDS Informat | tion | |
| | Part | Lot | Dilution | Initial | Uncertainty | Nominal | Initial | Final | Uncertainty | (Solv | vent Safety Info. On A | Attached pg.) | NIST |
| Compound | Number | Number | Factor | Vol. (mL) | Pipette (mL) | Conc. (µg/mL) | Conc. (µg/mL) | Conc. (µg/mL) | +/- (µg/mL) | CAS# | OSHA PEL (TWA) | LD50 | SRM |
| | 50450 | 0.11.000 | 0.4000 | | 0.004 | 1000 | 10000 5 | 1000.0 | | 10010 01 7 | 7 | | 0101 |





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

(T)= Target analyte

Physical Characterization:

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

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

Certified by:

Bur Y. All

Absolute Standards, Inc 00-368-1131 /ww.absolutestandards.com	D.			(Certified I	Reference l	Material CF	RM			ANAE AR-1 https://	3 ISO 17034 A 539 Certificate Absolutestand	ccre Nui ards
CERTIFIED WEIGHT REPORT:	b - u.	57000				Lot #	Solvent:	Ī					71
Lot Num	iber:	<u>57022</u> 070721				20370011	NITIC ACIO		A	Furme	Bang		
Descrip	tion:	Titanium	<u>(TI)</u>			2.0%	40.0	Nitric Acid	Formulated B	v.	Lawrence Barry	070721	
Expiration	Date:	070724				2.070	(mL)			,. 1		0,0,21	
Recommended Sto	rage:	Ambient (20	O°C)						4		Rent		
Nominal Concentration (µg	/mL):	1000							- Jun	× 1	ino		
NIST Test Nun	1ber:	6UTB	0000.00	5E-05	Balance Unce	rtainty		Į	Reviewed By		Pedro L. Rentas	070721	
volume snown be	low was dilu	ted to (mL):	2000.02	0.058	Flask Uncerta	inty			Expanded		SDS Informatio	on	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Sol	vent Safety Info. On Att	tached pg.)	NIS
Compound	Number	Number	Factor	Vol. (mL)	Pipette	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SR
Ammonium hexafluorotitanate (Ti)	58122	070120	0.1000	200.0	0.084	1000	10000.1	1000.0	2.2	16962-40-6	5 2.5 (F) mg/m3	NA	316
[1] 90			34 693 6	001:57	022 D# [poarl						
1.0E5	cettami		04.000 3		022.0"		licalj						
-													
-													
5.0E4-													
												F	
m/z->	10	20	30	5	40	50	60	70)	80	90 10	00	
2.0E8													
1.0E8-													
m/z->	110	120	13	0	140	150	160	17	0 -	180	190 20	50	

210

230

220

240

5.0E7

2.5E7-

m/z->

250

260



							Trace M	etals	S Verifica	tion	by ICP-M	S (µ	g/mL)						
		-		1		-				-		1		-		_		-	
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	< 0.02	W	<0.02
Sb	< 0.02	Ca	<0.2	Er	<0.02	Ho	< 0.02	Lu	<0.02	Nb	< 0.02	Re	<0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	< 0.02	Rh	<0.02	Ag	<0.02	Tl	<0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	<0.02	Ir	<0.02	Mn	<0.02	Pd	< 0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	<0.02	Fe	< 0.2	Hg	<0.2	Р	< 0.02	Ru	<0.02	Sr	< 0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Co	< 0.02	Ge	<0.02	La	<0.02	Мо	<0.02	Pt	<0.02	Sm	<0.02	S	<0.02	Sn	<0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	<0.02	Pb	< 0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Та	<0.02	Ti	Т	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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Bur Y. All

Certified by:

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com			C	Certified F	Reference l	Material CF	8M			AN. AR https	AB ISO 17034 A -1539 Certificate ://Absolutestand	ccredit Numl ards.co
CERTIFIED WEIGHT REPORT:					Lot #	Solvent:						
Part Number: Lot Number: Description:	<u>57081</u> 073021 Thallium (1	<u>[])</u>			20370011	Nitric Acid		Giovo	nni (Esposito		
					2.0%	40.0	Nitric Acid	Formulated By	:	Giovanni Esposito	073021	1
Expiration Date: Recommended Storage: Nominal Concentration (µg/mL):	073024 Ambient (20 1000	°C)				(mL)		Field	1 10 T	tento	070001	-
NIST Test Number: Volume shown below was dilute	ed to (mL):	2000.02	5E-05 0.058	Balance Uncert Flask Uncertair	tainty		l	Reviewed By:		Pedro L. Rentas	073021	<u>_</u>]
								Expanded		SDS Informa	tion	
Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On	Attached pg.)	NIST
Compound Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (μg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1 Thallium (TI) 58181	060920	0 1000	200.0	0 084	1000	10001.0	1000.0	2.2	7440-28-0	0.1 ma/m3	orl-rat 6700 mg/kg	3158





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

(T)= Target analyte

Physical Characterization:

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



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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	Ś			C	Certified I	Reference	Material CF	RM		Þ	AN AF https	AB ISO 17034 A 1-1539 Certificate ://Absolutestand	ccredite Numbe ards.co
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Numbe	r:	<u>58030</u>				20370011	Nitric Acid		a 1	æ	C +		1
Lot Number	r:	<u>031921</u>							Liove	inne	Esposito	2	
Descriptior	1:	Zinc (Zn)							<i>, , , , , , , , , ,</i>		L		
						2.0%	40.0	Nitric Acid	Formulated By	/:	Giovanni Esposito	031921	
Expiration Date	e:	031924					(mL)			7	\wedge		
Recommended Storage	e:	Ambient (20	O°C)							1, -	ton		
Nominal Concentration (µg/mL):	1000							Jun	~~ /	into		
NIST Test Number	r:	6UTB		5E-05	Balance Unce	rtainty			Reviewed By:		Pedro L. Rentas	031921]
Volume shown below	was dilut	ed to (mL):	2000.02	0.058	Flask Uncertai	inty			-				
									Expanded		SDS Informa	tion	
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Sol	vent Safety Info. On	Attached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1 Zinc nitrate hexabydrate (Zn)	58130	082020	0 1000	200.0	0 084	1000	10000.3	1000.0	2.2	10196-18-6	6 1 ma/m3	orl-rat 1190mg/kg	3168





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

(T)= Target analyte

Physical Characterization:

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

Certified by:

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ıdards,

Certified Reference Material CRM



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

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

Concession of the local division of the loca								Trace N	letals	Verifica	tion	by ICP-M	<u></u> 91) S	/L)						
	A. S.	Sector College				and the second s		Balance and a second				States and the second						South State of States		
	AI	<0,3	Cd	<0.1	Dy	<0.1	Hſ	<0.1	Li	<0.1	N	75	Pr	<0.1	Se	<0.5	ТЪ	<0.1	W	<0.1
	Sb	~4	Ca	ŝ	E	<0.1	Но	< 0.1	Lu	<0.1	Nb	<0.1	Re	<0.1	Si	<10	Te	<0.1	U	<0.3
-	As	۵	Ce	<0.1	Eu	<0.1	In	<0.1	Mg	<0.5	Os	<0.1	Rh	<0.1	Ag	<0.1	TI	<0.1	<	<0.3
-	Ва	<0.1	Cs	<0.1	Gd	<0.1	١r	<0.1	Mn	85	Pd	<0.1	Rb	<0.1	Na	٥	Th	<0.1	Yb	<0.1
-	Be	<0.1	ſ	33	Ga	Ċ,	Fe	Т	Hg	<0.1	Р	<0.1	Ru	<0.1	Sr	<0.1	Tm	<0.1	Y	<0.1
-	Bi	<0.1	Co	80	Ge	60	La	< 0.1	Mo	۵	Pt	<0.1	Sm	<0.1	s	<0.1	Sn	۵	Zn	<45
-	в	Q,	Cu	50	Au	<0.1	РЬ	<0.3	Nd	<0.1	к	ç	Sc	<0.1	Ta	<0.1	Ti	<0.1	Ζr	<0.1

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

(T)= Target analyte

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com			C	Certified	Reference	Material CF	RM			ANA AR- https:/	B ISO 17034 A 1539 Certificate //Absolutestand	ccredite Numbe ards.cor
CERTIFIED WEIGHT REPORT:					Lot #	Solvent:						
Part Number:	<u>58029</u>				20370011	Nitric Acid			7	R		1
Lot Number:	<u>080321</u>							Ca	mone	Dang		
Description:	Copper (C	<u>u)</u>								\bigcirc		
					2.0%	40.0	Nitric Acid	Formulated By:		Lawrence Barry	080321	
Expiration Date:	080324					(mL)			,	\wedge		
Recommended Storage:	Ambient (20	°C)							1 7	Port -		
Nominal Concentration (µg/mL):	1000							fila		ento		
NIST Test Number:	6UTB		5E-05	Balance Unce	rtainty			Reviewed By:		Pedro L. Rentas	080321]
Volume shown below was dil	uted to (mL):	2000.02	0.058	Flask Uncerta	inty							-
								Expanded		SDS Informat	ion	
Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	ent Safety Info. On A	ttached pg.)	NIST
Compound Number	er Number	Factor	Vol. (mL)	Pipette	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM





	Trace Metals Verification by ICP-MS (µg/mL)																		
Δ1																			
Sb	<0.02	Ca	<0.02	Er	<0.02	Но	<0.02	Lu	<0.02	Nb	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	U U	<0.02
As	<0.2	Ce	< 0.02	Eu	<0.02	In	< 0.02	Mg	<0.01	Os	< 0.02	Rh	<0.02	Ag	< 0.02	Tl	< 0.02	v	< 0.02
Ba	<0.02	Cs	< 0.02	Gd	<0.02	Ir	< 0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Yb	<0.02
Be	<0.01	Cr	< 0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	<0.02	Ru	<0.02	Sr	< 0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	Co	< 0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Pt	<0.02	Sm	<0.02	S	< 0.02	Sn	<0.02	Zn	< 0.02
В	< 0.02	Cu	Т	Au	<0.02	Pb	< 0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Та	< 0.02	Ti	<0.02	Zr	< 0.02

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Certified by:

Certificate of Analysis **ThermoFisher** S C I E N T I F I C

M4913-16

Page 1 of 1

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 Buston

Julian Burton - Quality Control Manager - Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701. *Based on suggested storage condition. Certificate of Analysis **ThermoFisher** S C I E N T I F I C

MY917-20

Certificate of Analysis

MB

1 Reagent Lane	
Fair Lawn, NJ 07410	
201.796.7100 tel	Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System
201.796.1329 fax	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, D	IHYDRATE 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	No animal products are use processing aids, or any other	d as starting raw material ingredients, or used er material that might migrate to the finished p	d in processing, including lubricants, product.

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 Buston

Julian Burton - Quality Control Manager - Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701.

*Based on suggested storage condition.

Image: State	Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT:	Part Number: Lot Number: Description:		Recommended Storage:	NIST Test Number	Volume shown below v		Compound	1. Lithium nitrate (Li)	2.0E5 	m/z->	S.0E7	m/z-> 1	2.SE7-	m/z-> 2
Lot / Image: Solven: So			<u>57003</u> 030221 Lithium (Li)		030224 Ambient (20 °C	22060	vas diluted to (mL):		Part Lot Number Number	58103 010320	[32.099 sec]:58003.D# [Co	0 20		10 120		022 01
Certified Reference Material CRM MAPS Participation Participation Lot # Solvent: 19410105 Ninic Acid (nL) Formulated Prince AD-1539 Certificate N (nL) 2.0% 4.0 Ninic Acid (nL) Formulated Prince Formulated Prince Marce Damy Patronovinavy Nonnal India Fail Formulated Prince Inaveneo Bany 00022 Patronovinavy Nonnal India Fail Unevened Prince SDS Information Non Unevenue Nonnal Fail Unevenued Prince SDS Information Non Non Otext Long/minit Conc. (ug/minit) Conc. (ug/minit) Conc. (ug/minit) Conc. (ug/minit) Conc. (ug/minit) Non Attached psile Non Otext 1000 1000.5 1000.0 2.2 7190-694 Smg/minit Original 1428 mg/minit No Via 100 100 100 100 100 100 100 100 Via 100 100 100 100 100 100 100 100					3)		2000.02 0.058		Dilution Initial Factor Vol. (mL	0.1000 200.0	unt] [Linear]	30		130		230
rence Material CRM MASS Products ISO 17034 Acct of solvent: 10105 Nitric Acid Mitric Acid Mitric Acid Mitric Acid Mitric Acid Final Mitric Mitric By: Mitric Mitric By: Mitric Acid Final Mitric Mitric By: Mitric By: Mitric Mitric By: Mitric Mitric By: Mitric Mitric By: Mitric M	Certified Refe	-	194	N			Flask Uncertainty		Uncertainty Na) Pipette (mL) Conc.	0.084		40		140		240
M MARY River River Parts Social Social Access Acces	rence Material CR	ot # Solvent:	10105 Nitric Acid	.0% 40.0	(mL)				ominal Initial (µg/mL) Conc. (µg/mL)	000 10000.5		50 60		150 160		250 260
By: Pedro L Rentas 030221 By: Pedro L Rentas 030221 AR-1539 Certificate NL Nttps://Absolutestandardt V SDS Information V (Solvent Safety Info. On Attached pg.) Nt Lawrence Barry 030221 V CAS# OSHA PEL (TWA) LD50 No 049-4 5 mg/m3 ori-rat 1426 mg/kg Nt 160 90 100 100 200	m M4939		\square	Nitric Acid Formulate	Ŵ	Basiana		Expanded	Final Uncertaint Conc. (µq/mL) +/- (µq/m	1000.0 2.2		70		170		
Mithe ISO 17034 Accre AR-1539 Certificate Nu AR-1539 Certificate Nu inc L Remas 030221 inc L Remas 030221 in			Serone L	d By: Lav	in the		-y.	4	ty (Solvent : nL) CAS# OS	7790-69-4		80		180		
SO 17034 Accrr 9 Certificate Nu solutestandard: 030221 030221 Ni LD50 SR Ni LD50 SR	AR-152		Or	wrence Barry				SDS Information	Safety Info. On Attac HA PEL (TWA)	5 mg/m3 ori-	а.	100		200		
	SO 17034 Accre 9 Certificate NL solutestandards		F	030221		000001			LDSO SF	rat 1426 mg/kg N				-		

1 of 2

Printed: 9/21/2021, 3:55:21 PM

Part # 57003

Lot # 030221

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Certified Reference Material CRM



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

\$

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

в	Bi	Be	Ba	As	Sb	A			
<0.02	<0.02	<0.01	<0.02	<0.2	<0.02	<0.02			
5	S	Q	S	င့	ß	Cd			
40.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02			
Au	ଜ	Ga	Gd	Eu	Ę	Dy			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
РЬ	La	Fe	F	Ы	Но	Hf			
<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	and the second second	I Face M	T-nn M
Nd	Mo	Hg	Mn	Mg	Lu	Ŀ	in Number	etais	1+15
<0.02	<0.02	<0.2	<0.02	<0.01	<0.02	Т		Verifica	1/2-ifing
ĸ	Pt	P	Pd	SO	Nb	Ni		LION	+
<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		DY ICP-N	
Sc	Sm	Ru	Rb	Rh	Re	Pr		in Chi	5
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	のないのであるのである	J/mL)	
Ta	s	Sr	Na	Ag	Si	Se	A CONTRACTOR OF		
<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2	のなどのないのないので、「「ない」の		
Ti	Sn	Tm	Th	Π	Te	ТЪ	States and		
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	の「日本のない」という		
Zr	Zn	Y	YЪ	<	С	W			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			

(T)= Target analyte

Physical Characterization:

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

Son P. Shirt

Certified by:

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

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* All standard containers are meticulously cleaned prior to use.

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

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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).

Part # 57003 Lot # 030221

m/z->	N.5 5 6	m/z-> 5.0E6	1.0E6	11/2-> 2.0E6	2.5E7	5.0E7	1. Indium Oxide (In)	Compound	Expi Recommend Nominal Concentrati NIST Te Weight show	ERTIFIED WEIGHT REPOR	ww.absolutestandards.cor
210		110		10		1] Spectrum	INO	R	ration Date: ed Storage: on (µg/mL): st Number: st Number: n below was dil	<u>∏:</u> rt Number: ot Number: escription:	n
220		120		NO		No.1	86 W1096A	# Lot Wumber C	100724 Ambient (20 10000 6UTB 6UTB	<u>58149</u> 100721 Indium (In	
230		130		8		2.965 sec]	10000 99.9	Nominal Puri onc. (µg/mL) (%	°C) 5E-(1/4960
240		140		4 0		:57049.D#	99 0.10 E	ty Uncertainty A) Purity (%))5 Balance Uncerta)8 Flask Uncertaint	Solv	R: 10/05
250		150		50		[Count] [Lin	32.6 6.05408	ssay Target (%) Weight (g)	5% 25.0 (mL)	Lot #	12/21
260		160		0		ear]	6.05441 1	Actual Weight (g) Cou	NIFIC ACI	Nitric Acid	j.
		170		70			10000.6 2	Exp: Actual Unce nc. (µg/mL) +/- (Revi) je	
		180		08			0.1 1312-43-2	nded rtainty (Sc ug/mL) CAS#	awed By:	fioranci	¢
		190		00			NA	SDS Infc olvent Safety Infc OSHA PEL (1	Pedro L. Rent	Esper	
		200		100			NA	hyrmation h. On Attached pg.) WA) LD50		Et .	https://Absolutes
							3124a	NIST	0721		tandards.co

1 of 2

Part # 58149

Lot # 100721

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		Inc.



Certified Reference Material CRM



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

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

press.	ALC: NO	-	-		1000		1	1	
в	Bi	Be	Ba	As	Sb	A			
<0.02	<0.02	<0.01	<0.02	<0.2	<0.02	<0.02			
Cu	ĉ	ç	Cs	Ce	Ca	Cd			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02			
Au	Ge	Ga	Gd	E	Ę	Dy			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
РЪ	La	Fe	F,	In	Но	Hf	ALC: UNIVERSITY		
<0.02	<0.02	<0.2	<0.02	Т	<0.02	<0.02		I LACE ME	
Nd	Mo	Hg	Mn	Mg	L	Li		etais	
<0.02	<0.02	<0.2	<0.02	<0.01	<0.02	<0.02		Verificat	1
*	Pt	P	Pd	°0	Nb	Ni		cion d	
<02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		Y ICP-M	
Sc	Sm	Ru	Rb	Rh	Re	Pr		y Crig	-
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		mL)	
Ta	s	Sr	Na	Ag	Si	Se			
<0.02	<0.02	<0.02	40.2	<0.02	<0.02	<0.2			
Ц	Sn	Tm	Th	Н	Te	ТЪ			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Zr	Zn	Y	УЪ	<	G	W			
<0.0	.0>	<0.0	0.0>	<0.0	<0.0	-0.0			
	B 40.02 Cu 40.02 Au 40.02 Pb 40.02 Nd 40.02 K 40.2 Sc 40.02 Ta 40.02 Ti 40.02 Zr 40.0	Bi <0.02 Co <0.02 Ge <0.02 La <0.02 Mo <0.02 Pt <0.02 Sm <0.02 S <0.02 Zn <0.02 B <0.02	Be 40.01 Cr 40.02 Ga 40.02 Fe 40.2 Hg 40.2 P 40.02 Ru 40.02 Sr 40.02 Tm 40.02 Y 40.02 Bi 40.02 Co 40.02 Ge 40.02 La 40.02 Mo 40.02 Pt 40.02 Sn 40.02 Sn 40.02 Zn 40.02	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	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Al 40.02 Cd 40.02 Dy 40.02 Hf 40.02 Li 40.02 Ni 40.02 Pr 40.02 Se 40.2 Tb 40.02 W 40.02 Sb 40.02 Ca 40.2 Er 40.02 Hf 40.02 Li 40.02 Ni 40.02 Se 40.2 Tb 40.02 W 40.02 As 40.2 Ce 40.02 Er 40.02 In T Mg 40.01 0s 40.02 Rb 40.02 Ag 40.02 Ti 40.02 V 40.02 Ba 40.02 Cs 40.02 Ir 40.02 Ma 40.02 Rb 40.02 Na 40.02 Ti 40.02 V 40.02 Ba 40.02 Cs 40.02 Fe 40.2 Hg 40.02 Pd 40.02 Na 40.02 Ti 40.02 Yb 40.02 Bi <td>AI 4002 Cd 4002 Dy 4002 Hf 4002 Li 4002 Ni 4002 Se 402 Th 4002 Cu 4002 Ff 4002 Ni 4002 Ni 4002 Se 402 Th 4002 Ff 4002 Ni 4002 Ni 4002 Se 4002 Si 4002 Si 4002 Ni 4002 Ni</td>	AI 4002 Cd 4002 Dy 4002 Hf 4002 Li 4002 Ni 4002 Se 402 Th 4002 Cu 4002 Ff 4002 Ni 4002 Ni 4002 Se 402 Th 4002 Ff 4002 Ni 4002 Ni 4002 Se 4002 Si 4002 Si 4002 Ni 4002 Ni

(I)= larget analyte

Physical Characterization:

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

the lite

Certified by:

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

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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 # 58139 Lot # (m/z->	1.0E5	m/z-> 2.0E5	2.5E4	m/z-> 5.0E4	1.006	2.0E6	1. Yttrium (III) Oxide (Y)	Weight shov Compound	NIST T	Recommence Nominal Concentral			CERTIFIED WEIGHT REPOR	Absolute Standard 800-368-1131 www.absolutestandards.co
052521	210		110		10		1] Spectrum	INO	vn below was dilu RM	est Number:	ion (µg/mL):		rt Number: ot Number: escription:	Ä	s, Inc.
	2220		120		NO		No.1	87 YV01201581	Lot # Number (6UTB	Ambient (20	00004	<u>58139</u> 052521 Yttrium (Y		
	230		130		ω O		12.624 sec	10000 99	2000.02 0.0 Nominal Pu Conc. (µg/mL) (1	5E	°C)	F		1 1 1 10	M4961
	240		140		40		:58139.D# [999 0.10 7	58 Flask Uncertainty rity Uncertainty A <u>(k)</u> Purity (%)	-05 Balance Uncertai			Solve		Certified F
1 of 2	250		150		сл О		Count] [Line	77.9 25.6744	y Issay Target (%) Weight (g)	inty		2% 40.0	ent: 20370011		Reference Ma
	260		160		Ø		əar]	25.6745	Actual Weight (g) Co			Nitric Acid	Nitric Acid		aterial CRM
			170		70			10000.0	Ex Actual Unc nc. (µg/mL) +/-	Rev	\ \	For			
			180		80			20.0 1314-36	oanded ertainty ((μg/mL) CAS#	riewed By:	Leca	mulated By:	Alm		\$
Printed: 10/7/20			190		0 0			AN 6-5	SDS Infi (Solvent Safety Inf OSHA PEL (Pedro L. Ren	ten	Lawrence Ba	one Br		
021, 2:18:04 P			200		100				ormation o. On Attached r TWA) L	tas	Ø	rry	Ŷ		ANAB ISO AR-1539 C https://Absolu
Z	s.							NA NA	ng.) NIST D50 SRV	052521		052521			17034 Accrei ertificate Nur itestandards.
	L							1							lited nber com

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



Certified Reference Material CRM



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

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

							race Me	tals	Verifica	ition	by ICP-	MS (µg/mL)						
AI	<0.02	Cd	<0.02		2002	l 1 ⁵ L	2000				のないのないのであるというので								
Ş	500) (1 5	10.02	E	20.02	5	<0.02	Z	<0.02	ዮ	<0.02	Se	<0.2	4L	<0.02	¥	<0.02
	10.01	6	10.1	5	<0.02	Ho	<0.02	Lu	<0.02	N ^b	<0.02	Re	<0.02	S	<0.02	2	c0 02	T	2023
AS	<0.2	Ce	<0.02	E	<0.02	In	<0.02	Ma	10.01	ç	2	Dr.	5	-			10.01	0	10.02
Ba	<0.02	ç	500	5	53	4		d	10.01	03	10.02	2	10.02	20	20.02	11	20.02	<	<0.02
ţ		5	70.01	00	20.05	Ħ	<0.02	Mn	<0.02	Pd	40.02	Rb	<0.02	Na	40.2	Ţ	c0 0>	4	500
De	10:0>	ç	<0.02	ଦୁ	<0.02	Fe	<0.2	Ho	c 0>	٥	3	Ð,	3	?	3				10.01
Bi	<0.02	ŝ	<0.02	ş	5002		3		2	, ,	10.01		10.02	2	70.02	IIII	<0.02	Y	-
æ	c0 02	2	3		10.01		20.02	OIM	<0.02	Pt	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	0.02
	- CON	100	10.04	AU	20.05	140	<0.02	Nd	<0.02	K	<0.2	Sc	<0.02	Ta	<0.02	H	<0.02	77	300
										Contraction of the local division of the loc	A DESCRIPTION OF THE OWNER OWNER OF THE OWNER	COLORADO IN COLORADO INC.	a state of the sta						

(T)= Target analyte

Physical Characterization:

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

Son 1. All

Certified by:

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Part # 58139 Lot # 052521

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Absolute Standar 800-368-1131 www.absolutestandards.	ds, Inc. com		VV.	sol9	rtified Ref	erence Mat $2 \cdot (2/0)$	terial CRM りと	(Bb)			AN/ AR- https:	B ISO 17034 (1539 Certifica //Absolutestan	Accredited e Number lards.com
CERTIFIED WEIGHT REP	<u>ORT:</u> Part Number: Lot Number: Description:	<u>57116</u> 011421 Sulfur (S)			Solvent	Lot #	ASTM Type	1 Water	J.	Consure	J.		
E Recomm Nominal Concent NIS1 Weight sh	Xpiration Date: ended Storage: tration (µg/mL): T Test Number: nown below was di	011424 Ambient (20 [°] 10000 23060 Iluted to (mL):	°C) 1999.53	5E-05 Bal 0.100 Fla	ance Uncertainty sk Uncertainty				ormulated By teviewed By:	Ped	ence Barry	01142	
Compound	æ	Lot M# Number Co	Nominal onc. (ug/mL)	Purity Un (%) P	certainty Assay urity (%) (%)	r Target Weight (g)	Actual Weight (g) Co	Actual (nc. (µg/mL)	Expanded Incertainty +/- (µg/mL)	(Solvent CAS# 05	SDS Informat Safety Info. On ⊿ SHA PEL (TWA)	on ttached pg.) LD50	NIST SRM
1. Ammonium sulfate (S)	Z	117 SLBF9912V	10000.0	0.66	0.10 24.3	83.2191	83.2206	10000.2	20.2 77	83-20-2	NA	NA	3181
0002	[1] Spectrum	1 No.1 [24	4.004 se	oc]:581	16.D# [Co	unt] [Line	ar]						
1000													
~-z/ш	10	20	30		40	50	60	70	Ō		06	00	
б. ОЕБ													
S S S S													
~->/W	110	120	130	0	140	150	160	170	81	0	06	00	
2.065	•					ī.							
1.0E5													
t													
~-z/w	210	520	530		240	250	260						
Part # 57116 Lot #	# 011421					1 of 2				Printed:	12/8/2021, 12	:58:35 PM	

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





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

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

							I race Me	tals	Verificat	tion	by ICP-N	AS (hg/mL)							-
															A THEFT A MARK					and the second
4	1 <0.02	3	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	M	<0.02	11
St	<0.02	ථ	₫02	Ъ	<0.02	Ho	* <0.02	Ľ	<0.02	q	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	D	<0.02	
Ä	s <0.2	ප	<0.02	폡	<0.02	IJ	<0.02	Mg	<0.01	ő	<0.02	Rh	<0.02	Ag	<0.02	F	<0.02	>	<0.02	
ä	a <0.02	ű	<0.02	PB	<0.02	Л	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	ЧЦ	<0.02	Υp	<0.02	
ğ	≤0.01	പ്	<0.02	Ga	<0.02	Fe	<02	Hg	<0.2	d	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02	-
B	i <0.02	ර	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Ł	<0.02	Sm	<0.02	s	T	Sn	<0.02	Zn	<0.02	
B	<0.02	ð	<0.02	Au	<0.02	Pb	<0.02	PN	<0.02	К	<0.2	Sc	<0.02	Ta	<0.02	Ц	<0.02	Zr	<0.02	
											NAME AND ADDRESS OF TAXABLE PARTY.									1
	0								(T)= Tarç	jet an	alyte									

Physical Characterization:

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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 N Lot N Desci Expiratic Recommended S Nominal Concentration (NIST Test N Weight shown be 5.0E4 2.5E4 2.5E4 1000 5000
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Recommended S Nominal Concentration (
NIST Test N Weight shown be
Sompound
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m/z->
500
m/z->
5000
2500
3

1 of 2

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Lot # 032921

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



Certified Reference Material CRM



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

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

							Trace Mo	etals	Verifica	tion	by ICP-N	H) SV	g/mL)						
S	<0.02	ß	40.02	Dv	<0.02	Hf	20.02		200										
Sh	4003	ç	5	4	10.02		70.02	Ľ	20.05	N	20.02	7	<0.02	Se	40,2	9	<0.02	W	40.02
	- CONT	5	7.02	5	<0.02	Ho	<0.02	L	40.02	Nb	<0.02	Re	3	2	3	,	2	:	
As	402	ຊ	<0.02	Eu	<0.02	In I	500	N.		>		1		ç	70.02	10	20.02	C	20.02
Ra	33	ç	5	2		1	10.01	STAT	10.01	Ş	20.02	Kh	<0.02	Ag	<0.02	П	<0.02	<	<0.02
,		5	70.02	Od	20.02	Ir	<0.02	Mn	<0.02	Pd	<0.02	Rh	403	Ş	3	2	3	5	
Ве	<0.01	Ω	<0.02	Ga	20.02	ž,	2	Ę	5	,	ł		10104		101	111	20.02	ID	20.02
R.	33	?	2	>			7.01	311	2.02	~	T	Ru	40.02	ST	<0.02	ī	40.02	~	<0 02
!	10.02	5	20.02	Ge	<0.02	5	<0.02	Mo	40.02	Þ	c0 02	î	3	2	5	2			
8	<0.02	5	<0.02	Au	300	Ŗ	202	H	3	: :		2011	70.02	0	20.02	Sn	<0.02	Zn	<0.02
							7001	ING	20.02	×	<02	Sc	<0.02	Ta	<0.02	T	40.02	27	<0.02
								A NUMBER OF CONTRACT											10101

(T)= Target analyte

Physical Characterization:

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

In 1. She

Certified by:

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

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 57115 Lot # 032921



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) HCl
Value / Analyte(s):	10 μg/mL ea: Mercury
Starting Material:	Hg metal
Starting Material Lot#:	1959
Starting Material Purity:	99.9994%
CERTIFIED VALUES	AND UNCERTAINTIES

Certified Value:	10.001 ± 0.053 μg/mL
Density:	1.020 g/mL (measured at 20 \pm 4 °C)

Assay Information:

3.0

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Hg	ICP Assay	3133	160921
Hg	EDTA	928	928
Hg	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 _{CRNRM} , 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
w_j = the weighting factors for each method calculated using the inverse square of the variance. $w_j = (1/u_{char})^2 / (\Sigma(1/(u_{char})^2))^2)$	uchar a = the standard uncertainty of characterization Method A
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 $(u^2_{char} a + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$
k = coverage factor = 2	k = coverage factor = 2
$u_{char} = \left[\sum \left((w_i)^2 (u_{char})^2 \right) \right]^{\frac{1}{2}}$ where u_{char} are the errors from each characterization method	uchar a = the errors from characterization
ubb = bottle to bottle homogeneity standard uncertainty	ubb = bottle to bottle homogeneity standard uncertainty
u _{lts} = long term stability standard uncertainty (storage)	ults = long term stability standard uncertainty (storage)
u_{ts} = transport stability standard uncertainty	u _{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

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

0	Ag		0.000011	Μ	Eu	<	0.000201	0	Na		0.000004	Μ	Se	<	0.015915	0	Zn	<	0.001510
0	AI		0.000001	0	Fe		0.000001	М	Nb	<	0.000201	0	Si		0.000005	М	Zr	<	0.000201
М	As	<	0.000402	Μ	Ga	<	0.000201	М	Nd	<	0.000201	М	Sm	<	0.000201				
М	Au	<	0.003631	М	Gd	<	0.000201	M	Ni	<	0.000402	М	Sn	<	0.001007				
М	В	<	0.001208	М	Ge	<	0.000201	Μ	Os	<	0.000605	М	Sr	<	0.000201				
М	Ba	<	0.000201	Μ	Hf	<	0.000201	0	Ρ	<	0.032370	Μ	Та	<	0.000201				
М	Be	<	0.000201	s	Hg	<		Μ	Pb	<	0.000201	M	Tb	<	0.000201				
Μ	Bi	<	0.000201	М	Ho	<	0.000201	Μ	Pd	<	0.000403	М	Te	<	0.002216				
0	Ca		0.000007	Μ	In	<	0.000201	Μ	Pr	<	0.000201	М	Th	<	0.000201				
М	Cd	<	0.000201	М	Ir	<	0.000201	М	Pt	<	0.000402	M	Ti	<	0.000402				
М	Ce	<	0.000201	0	Κ		0.000020	Μ	Rb	<	0.000201	0	ΤI	<	0.016508				
M	Co	<	0.000201	М	La	<	0.000201	Μ	Re	<	0.000201	Μ	Tm	<	0.000201				
0	Cr	<	0.003021	0	Li	<	0.000107	М	Rh	<	0.000201	М	U	<	0.008058				
М	Cs	<	0.001208	М	Lu	<	0.000201	Μ	Ru	<	0.000201	М	V	<	0.000201				
М	Cu	<	0.000402	0	Mg		0.000001	0	S	<	0.053950	М	W	<	0.000604				
М	Dy	<	0.000201	M	Mn	<	0.000604	М	Sb	<	0.001208	M	Y	<	0.000201				
М	Er	<	0.000201	М	Мо		0.000009	М	Sc	<	0.000201	М	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 $4^{\circ} - 24^{\circ}$ C to minimize the effects of transpiration. Use at $20^{\circ} \pm 4^{\circ}$ C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 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 guestions 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

Ulya new

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Laine



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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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

Page 1 of 2

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



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



ICSA

M5126

M5127

M5128

M5129

M5130

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

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

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

Table 1.	"CERTIFIE	D VALUES" AND IC	FOR INTERF CSA-1211 MI	ERENCE CH	IECK SAMPL CSB-0710	E ICP-AES I	CSA-1211,
Element	CRQL	Part A (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	Part A +Part B (µg/L)	Low Limit (µg/L)	High Limit (µg/L)
AI	200	255000	216000	294000	247000	209000	285000
Sb	60	(0.0)	-60.0	60.0	618	525	711
As	10	(0.0)	-10.0	10.0	104	88.4	120
Ba	200	(6.0)	-194	206	(537)	337	737
Be	5.0	(0.0)	-5.0	5.0	495	420	570
Cd	5.0	(1.0)	-4.0	6.0	972	826	1120
Ca	5000	245000	208000	282000	235000	199000	271000
Cr	10	(52.0)	42.0	62.0	542	460	624
Со	50	(0.0)	-50.0	50.0	476	404	548
Cu	25	(2.0)	-23.0	27.0	511	434	588
Fe	100	101000	85600	116500	99300	84400	114500
Pb	10	(0.0)	-10.0	10.0	(49.0)	39.0	59.0
Mg	5000	255000	216000	294000	248000	210000	286000
Mn	15	(7.0)	-8.0	22.0	507	430	584
Ni	40	(2.0)	-38.0	42.0	954	810	1100
Se	35	(0.0)	-35.0	35.0	(46.0)	11.0	81.0
Ag	10	(0.0)	-10.0	10.0	201	170	232
TI	25	(0.0)	-25.0	25.0	(108)	83.0	133
V	50	(0.0)	-50.0	50.0	491	417	565
Zn	60	(0.0)	-60.0	60.0	952	809	1095

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

m/z->	5.0E7	m/z-≻ 1.0E8	5.0E7	m/z->	N.55 0	5.000	1. Manganese(II) nitrate tetrak	Compound	Exp Recomment Nominal Concentrat NIST T Volume sh	CERTIFIED WEIGHT REPORT: Pa L	Absolute Standards 300-368-1131 www.absolutestandards.cor
210		110		10		l] Spectrur	nydrate (Mn) 5	7	iration Date: ded Storage: tion (µg/mL): 'est Number: iown below wa:	art Number: ot Number:)escription:	s, Inc.
						n No.	58125	Part	s dilutec	1210147	
220		120		20		1 [2	021022	Lot Number	060125 Ambient (20 1 000 SUTB	<u>.8025</u> 160122 Manganes	¥
230		130		зо		4.243 s	0.1000	Dilution Factor	°C) 3000.41	e (Mn)	
U		Ŭ				əc]:570	300.0	lnitial Vol. (mL)	5E-05	MS	0
240		140		4)25.D# [0	0.084	Uncertainty Pipette (mL)	Balance Uncer	184	ertified R
250		150		50		Count] [L	1000	Nominal Conc. (µg/mL)	2.0%	Lot # 20510011	eference
260		160		e0		inear]	10000.5	Initial) Conc. (µg/mL	60.0 (mL)	Solvent: Nitric Acid	Material Cf
•		1 7		7			1000.0	Final) Conc. (µg/mL)	Nitric Acid		R :
		Ō		0			2.1	Expanded Uncertainty +/- (µg/mL)	Formulated Reviewed B		6121-
		180		8			20694-39-	(So CAS#		Germa	
		190		0			7 5 mg/	SDS In vent Safety Ir OSHA PEL	Lawrence Pedro L. Re	(fr	
		200		100			m3 ort-ı	formation 1fo. On Attacl (TWA)	antas Barry	Y	ANAB IS AR-153 https://Ab
		-					rat ≻300mg/k	hed pg.) LD50	06012		3O 17034 9 Certifica solutestan
							g 3132	NIST		<u></u>]	Accredite Ite Numbe dards.com

Part # 58025 Lot # 060122

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



Certified Reference Material CRM



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

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

							Trace Me	etals	Verifica	tion	by ICP-M	S (h)	g/mL)			х.			
																BEARING ST			
A	<0.02	8	40.02	Ð	<0.02	Hf	<0.02	Li	<0.02	N	<0.02	Pr	<0.02	Se	<0.2	5	<0.02	W	<0.02
Sp	<0.02	ß	40.2	曱	<0.02	Но	<0.02	Lu	<0.02	ß	<0.02	Re	<0.02	S	<0.02	Te	<0.02	C	<0.02
As	<0.2	ŝ	<0.02	臣	<0.02	Б	<0.02	Mg	<0.01	S0	<0.02	Rh	<0.02	Ag	<0.02	T	<0.02	<	<0.02
Ba	<0.02	ູ	<0.02	ଜ	<0.02	ŀ	<0.02	Mn	Т	Pd	<0.02	Rb	<0.02	Na	40.2	Th	<0.02	ΥЪ	<0.02
Be	<0.01	Q	<0.02	Ga	<0.02	Fe	40.2	Hg	<0.2	P	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.02	Y	<0.02
Bi	<0.02	S	<0.02	ଜ	<0.02	5	<0.02	Mo	<0.02	P	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	Zn	<0.02
в	40.02	5	<0.02	Au	<0.02	Рb	<0.02	Nd	<0.02	ĸ	40.2	Sc	<0.02	Ta	<0.02	H	<0.02	27	<0.02

(T)= Target analyte

Physical Characterization:

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

Certified by:

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

the 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).

In P. S.

NR181

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Part # 58025

m/z->	5. OE	m/z-> 1.0E5	N 5 11 4	m/z->	1.0E4	2.0E4	1. Calcium carbonate (Ca)	Compound	Weight showr	Nominal Concentratio	Expir	De	Par	CERTIFIED WEIGHT REPO	Absolute Standarc 800-368-1131 www.absolutestandards.c
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Absolute Standards, Inc. www.absolutestandards.com 800-368-1131





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



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Physical Characterization:

(T)= Target analyte

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

Certified by:

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

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www.absolutestandards.cc
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Part # 58111 Lot # 092121

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



Certified Reference Material CRM



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

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

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Physical Characterization:

(T)= Target analyte

Certified by:

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Part # 58111 Lot # 092121

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Certified Reference Material CRM



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

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

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(T)= Target analyte

Physical Characterization:

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Sulfuric Acid

MEZICE ME

Avantor



Material No.: 9673-33 Batch No.: 22D0862014 Manufactured Date: 2022-02-23 Retest Date: 2027-02-22 Revision No.: 0

Certificate of Analysis

Test	Specification	Result
ACS – Assay (H2SO4)	95.0 - 98.0 %	96.5 %
Appearance	Passes Test	Passes Test
ACS – Color (APHA)	≤ 10	5
ACS – Residue after Ignition	≤ 3 ppm	< 1 ppm
ACS – Substances Reducing Permanganate (as SO2)	≤ 2 ppm	< 2 ppm
Ammonium (NH4)	≤ 1 ppm	< 1 ppm
Chloride (Cl)	\leq 0.1 ppm	< 0.1 ppm
Nitrate (NO3)	\leq 0.2 ppm	< 0.1 ppm
Phosphate (PO4)	\leq 0.5 ppm	< 0.1 ppm
Trace Impurities – Aluminum (Al)	≤ 30.0 ppb	1.7 ppb
Arsenic and Antimony (as As)	\leq 4.0 ppb	< 2.0 ppb
Trace Impurities – Boron (B)	\leq 10.0 ppb	< 5.0 ppb
Trace Impurities – Cadmium (Cd)	\leq 2.0 ppb	< 0.3 ppb
Trace Impurities – Chromium (Cr)	\leq 6.0 ppb	< 0.4 ppb
Trace Impurities – Cobalt (Co)	\leq 0.5 ppb	< 0.3 ppb
Trace Impurities – Copper (Cu)	\leq 1.0 ppb	< 0.1 ppb
Trace Impurities – Gold (Au)	\leq 10.0 ppb	< 0.2 ppb
Heavy Metals (as Pb)	≤ 500.0 ppb	< 100.0 ppb
Trace Impurities – Iron (Fe)	\leq 50.0 ppb	2.0 ppb
Trace Impurities – Lead (Pb)	\leq 0.5 ppb	< 0.5 ppb
Trace Impurities – Magnesium (Mg)	\leq 7.0 ppb	0.6 ppb
Trace Impurities – Manganese (Mn)	\leq 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	\leq 0.5 ppb	< 0.1 ppb
Trace Impurities – Nickel (Ni)	\leq 2.0 ppb	< 0.3 ppb
Trace Impurities – Potassium (K)	≤ 500.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se)	\leq 50.0 ppb	12.1 ppb
Trace Impurities – Silicon (Si)	≤ 100.0 ppb	4.4 ppb
Trace Impurities – Silver (Ag)	\leq 1.0 ppb	< 0.3 ppb

>>> Continued on page 2 >>>

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





Material No.: 9673-33 Batch No.: 22D0862014

Ťest	Specification	Result	
Trace Impurities – Sodium (Na)	≤ 500.0 ppb	6.2 ppb	
Trace Impurities – Strontium (Sr)	\leq 5.0 ppb	< 0.2 ppb	
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb	
Trace Impurities – Zinc (Zn)	≤ 5.0 ppb	0.6 ppb	

For Laboratory, Research, or Manufacturing Use

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

James Techie

C10 200 1700

Jamie Ethier Vice President Global Quality



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

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1.0 ACCREDITATION / REGISTRATION

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



2.0 PRODUCT DESCRIPTION

Ti

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

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

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ICP Assay

ANALYTE Boron, B	CERTIFIED VALUE 1 000 ± 7 μg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 1 000 ± 5 μg/mL	
Silicon, Si	1 000 ± 7 μg/mL	Tin, Sn	1 000 ± 5 µg/mL	
Titanium, Ti	1 001 ± 6 μg/mL			
Density:	1.032 g/mL (meası	ured at 20 ± 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

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

3162a

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

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

4.0

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2021

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

11.2 Lot Expiration Date

- November 02, 2026

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date:

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Director, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines Chairman / Senior Technical Director

Paul R Line



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

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

Contains Heavy Metals HAZARDOUS MATERIAL

Safety Data Sheets Available Upon Request

(A) SAMPLE DESCRIPTION

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

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

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

Page 1 of 2

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



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



ICSA

M5126

M5127

M5128

M5129

M5130

Instructions for QATS Reference Material: ICP-AES ICS

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

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

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

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

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

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

Table 1.	"CERTIFIE	D VALUES" AND IC	FOR INTERF CSA-1211 MI	ERENCE CH	IECK SAMPL CSB-0710	E ICP-AES I	CSA-1211,
Element	CRQL	Part A (µg/L)	Low Limit (µg/L)	High Limit (µg/L)	Part A +Part B (µg/L)	Low Limit (µg/L)	High Limit (µg/L)
AI	200	255000	216000	294000	247000	209000	285000
Sb	60	(0.0)	-60.0	60.0	618	525	711
As	10	(0.0)	-10.0	10.0	104	88.4	120
Ba	200	(6.0)	-194	206	(537)	337	737
Be	5.0	(0.0)	-5.0	5.0	495	420	570
Cd	5.0	(1.0)	-4.0	6.0	972	826	1120
Ca	5000	245000	208000	282000	235000	199000	271000
Cr	10	(52.0)	42.0	62.0	542	460	624
Со	50	(0.0)	-50.0	50.0	476	404	548
Cu	25	(2.0)	-23.0	27.0	511	434	588
Fe	100	101000	85600	116500	99300	84400	114500
Pb	10	(0.0)	-10.0	10.0	(49.0)	39.0	59.0
Mg	5000	255000	216000	294000	248000	210000	286000
Mn	15	(7.0)	-8.0	22.0	507	430	584
Ni	40	(2.0)	-38.0	42.0	954	810	1100
Se	35	(0.0)	-35.0	35.0	(46.0)	11.0	81.0
Ag	10	(0.0)	-10.0	10.0	201	170	232
TI	25	(0.0)	-25.0	25.0	(108)	83.0	133
V	50	(0.0)	-50.0	50.0	491	417	565
Zn	60	(0.0)	-60.0	60.0	952	809	1095

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.

Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com	Ś			C	Certified I	Reference	Material CF	RM		\$	AN AF https	AB ISO 17034 A 1-1539 Certificato ://Absolutestand	ccredited Number ards.com
CERTIFIED WEIGHT REPORT:						Lot #	Solvent:						
Part Number: Lot Number: Description:		57051 101521 Antimony	<u>(Sb)</u>			20370011	Nitric Acid		Hior	anni (Esposito	0	
						2.0%	40.0	Nitric Acid	Formulated B	y:	Giovanni Esposito	101521	
Expiration Date:		101524					(mL)			1	\wedge		
Recommended Storage:		Ambient (20	о°С)						4	1. 7	Ho - to		
Nominal Concentration (μ g/mL):		1000							- Jan		ana		
NIST Test Number:		6UTB		5E-05	Balance Uncer	tainty			Reviewed By		Pedro L. Rentas	101521	
Volume shown below v	vas dilute	ed to (mL):	2000.25	0.116	Flask Uncertai	nty			Expanded		SDS Informa	tion	_
	Part	Lot	Dilution	Initial	Uncertainty	Nominal	Initial	Final	Uncertainty	(Solv	vent Safety Info. On	Attached pg.)	NIST
Compound	Number	Number	Factor	Vol. (mL)	Pipette (mL)	Conc. (µg/mL)	Conc. (µg/mL)	Conc. (µg/mL)	+/- (µg/mL)	CAS#	OSHA PEL (TWA)	LD50	SRM
1. 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
[1] Spect	rum N	o.1 [·	17.964 s	ec]:580	051.D# [Count] [Li	inear]						





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

							Trace M	etals	· Verifica	tion	by ICP-M	S (µ	g/mL)						
		-		-		1		-		r		-		-		-		7	
Al	<0.02	Cd	<0.02	Dy	<0.02	Hf	<0.02	Li	<0.02	Ni	<0.02	Pr	<0.02	Se	<0.2	Tb	<0.02	W	< 0.02
Sb	Т	Ca	< 0.2	Er	< 0.02	Но	< 0.02	Lu	< 0.02	Nb	< 0.02	Re	< 0.02	Si	< 0.02	Te	< 0.02	U	< 0.02
As	<0.2	Ce	< 0.02	Eu	< 0.02	In	< 0.02	Mg	<0.01	Os	< 0.02	Rh	< 0.02	Ag	< 0.02	T1	< 0.02	V	< 0.02
Ba	< 0.02	Cs	< 0.02	Gd	<0.02	Ir	<0.02	Mn	< 0.02	Pd	< 0.02	Rb	<0.02	Na	<0.2	Th	< 0.02	Yb	< 0.02
Be	<0.01	Cr	< 0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	< 0.02	Ru	<0.02	Sr	<0.02	Tm	< 0.02	Y	< 0.02
Bi	< 0.02	Со	< 0.02	Ge	<0.02	La	<0.02	Мо	<0.02	Pt	< 0.02	Sm	<0.02	S	<0.02	Sn	< 0.02	Zn	< 0.02
В	< 0.02	Cu	< 0.02	Au	<0.02	Pb	< 0.02	Nd	< 0.02	K	<0.2	Sc	<0.02	Та	<0.02	Ti	< 0.02	Zr	< 0.02

(T)= Target analyte

Physical Characterization:

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

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Certified by:

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

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Absolute Standards, Inc. 800-368-1131 www.absolutestandards.com		MERN	Certifi	ed Reference	Material CRN	5	Ð		AN/ AR. https:	AB ISO 17034 Ac -1539 Certificate //Absolutestanda	credited Number rds.com
CERTIFIED WEIGHT REPORT: Part Number: Lot Number:	58029 022822			Lot # 20370011	Solvent: Nitric Acid		Hiera	nui E	aporto		
Description: Expiration Date:	Copper (1 022825	1		2.0%	40.0 (mL)	Nitric Acid	Formulated By		Giovanni Esposito	022822	
Recommended Storage: Nominal Concentration (µg/mL): MIST Tack Mumber	Ambient (2 1000 61178	0 °C) 5F	-05 Balance	Uncertainty			Reviewed By:	n n	Pedro L. Rentas	022822	
Volume shown below w	vas diluted to (mL):	2000.02 0. Dilution In	.058 Flask Unitial Uncert	ncertainty ainty Nominal	Initial	E Final	Expanded Uncertainty	(Solven	SDS Informal tt Safety Info. On <i>J</i>	tion 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. Copper(II) nitrate trihydrate (Cu)	58129 020821	0.1000 20	0.0	34 1000	10000.1	1000.0	2.2	10031-43-3	1 mg/m3	orl-rat 794 mg/kg	3114
с 0 0 0 0 0 0 0 0 0 0 0 0 0											
5.0E7	0	30	40	20	00	×	0	O	000	100	
С. С. С. С. С.											
2.0E7	0	0	- - 4	150	160		Q	180	190	200	
R z/E	10 220	230	42	250	260						

Part # 58029 Lot # 022822

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1 of 2

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Certified Reference Material CRM



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

1	-			-	_	-	1		
в	Bi	Be	Ba	As	Sp	AI			
<0.02	<0.02	< 0.01	< 0.02	<0.2	< 0.02	<0.02			
Cu	Co	Cr	Cs	Ce	Ca	Cd			
T	<0.02	<0.02	<0.02	< 0.02	<0.2	<0.02			
Au	Ge	Ga	Gd	Eu	Ę	Dy			
<0.02	<0.02	< 0.02	<0.02	< 0.02	< 0.02	<0.02			
РЬ	La	Fe	Ir	In	Ho	Hf			
<0.02	< 0.02	<0.2	< 0.02	< 0.02	< 0.02	<0.02	A CONTRACTOR OF A CONTRACT OF	Trace M	
Nd	Mo	Hg	Mn	Mg	Lu	Li		etals	
 <0.02	<0.02	<0.2	< 0.02	< 0.01	< 0.02	<0.02	Contraction of the local division of the loc	Verifica	
K	Pt	Р	Pd	O _s	Nb	Ni		tion	
<0.2	<0.02	<0.02	<0.02	< 0.02	<0.02	<0.02		by ICP-M	
Sc	Sm	Ru	Rb	Rh	Re	Pr		IS (µ	
<0.02	<0.02	<0.02	<0.02	<0.02	< 0.02	<0.02	NUMBER OF TAXABLE PARTY	g/mL)	
Ta	s	Sr	Na	Ag	Si	Se			
<0.02	<0.02	< 0.02	<0.2	<0.02	< 0.02	<0.2			
Ti	Sn	Tm	Th	T	Te	ТЬ			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Zr	Zn	Y	Υь	<	U	¥			
<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	Contraction of the second		

(T)= Target analyte

Physical Characterization:

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

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Part # 58029 Lot # 022822

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CERTIFIED WEIGHT REF	Part Number: Lot Number:	57023 100121 Vanadiur				Lot # 20370011	Solvent: Nitric Acid		Lieve	innie 8	aperte		
Recomn Nominal Concer	Expiration Date: nended Storage:	1000 (20 °C)			2.0%	60.0 (mL)	Nitric Acid	Formulated By	1	Giovanni Esposito	10012	
	ST Test Number: e shown below wa	6UTB s diluted to (mL).	3000.4	5E-05 0.06	Balance Uncertair Flask Uncertainty	Atr			Reviewed By:		Pedro L. Rentas	10012	TEI
Compound	~	Part Lot Vumber Number	Dilution Factor	Initial Vol. (mL)	Uncertainty Pipette (mL) C	Nominal onc. (µg/mL)	Initial Conc. (μg/mL)	Final Conc. (µg/mL)	Expanded Uncertainty +/- (µg/mL)	(Solvi CAS#	SDS Inform ent Safety Info. Or OSHA PEL (TWA)	ation Attached pg.) LD50	NIST SRM
1. Ammonium Metavana	adate (V)	58123 070721	0.1000	300.0	0.084	1000	10000.4	1000.0	2.1	7803-55-6	1.0 mg/m3	orl-rat 630 mg/kg	3165
2.0Ee	[1] Spectru	I No.1	34.243 s	ec]:580	23.D# [C	lini) [tuno	lear]	*					
1.0E6													
m/z-> 2.0E7		50	36	0	40	20	80	70	w	Q	00	100	
1.0E7	· · · · · · · · · ·												
m/z-> 5.0E8	*	120	T T	0	140	150	160	170	-	80	190	200	
а 2 У													
~~×/£	210	220	23	0	240	250	260						

Part # 57023 Lot # 100121

1 of 2

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

							Trace N	Aetals	Verifica	tion	by ICP-M	IS (U	g/mL)						
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ΑI	<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	M	<0.02
Sb	<0.02	Ca	<0.2	Ēr	<0.02	Но	<0.02	Lu	<0.02	βŊ	<0.02	Re	<0.02	Si	<0.02	Te	<0.02	D	<0.02
As	<0.2	ပိ	<0.02	Eu	<0.02	In	<0.02	Mg	<0.01	Os	<0.02	Rh	<0.02	Ag	<0.02	IT	<0.02	2	L
Ba	<0.02	Cs	<0.02	Gd	<0.02	Ŀ	<0.02	Mn	<0.02	Pd	<0.02	Rb	<0.02	Na	<0.2	Th	<0.02	Υh	<0.02
Be	<0.01	Ç	<0.02	Ga	<0.02	Fe	<0.2	Hg	<0.2	Р	<0.02	Ru	<0.02	Sr	<0.02	Tm	<0.07	>	<0.02
Bi	<0.02	c	<0.02	Ge	<0.02	La	<0.02	Mo	<0.02	Ł	<0.02	Sm	<0.02	s	<0.02	Sn	<0.02	7n	20.02
В	<0.02	Cu	<0.02	Au	<0.02	Pb	<0.02	PN	<0.02	Х	<0.2	Sc	<0.02	Ta	<0.02	Ξ	<0.02	Zr	<0.02
																	A second s		
									(T)= Target	analyte									

Physical Characterization:

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

Certified by:

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Absolute Standards, I 800-368-1131 www.absolutestandards.com	CERTIFIED WEIGHT REPORT:	Part Nu Lot Nu	Evolutio	Recommended S	Nominal Concentration (NIST Test N	Volume shown	Compound	1. Strontium nitrate (Sr)	2.066	1.0E6	1.0E8	5.0E7	m∕z-> 1.0E8	5.0E7	m/z->
, ,	•	mber: <u>570</u> mber: <u>073</u> 0		orage: Amb	g/mL): 1000	umber: 6UTI	below was diluted to	Part L Number Nur	58138 062	Spectrum No		10		110		013
•		120		ient (20 °C)		u	(mL): 3000.41	ot Dilution nber Factor	2321 0.1000	.1 [33.2		20 30		20 13		220 23
Certified MS228						5E-05 Balance Unce	0.058 Flask Uncerta	Initial Uncertainty Vol. (mL) Pipette (mL	300.0 0.084	72 sec]:570		ð		0 140		0 240
Reference Mat	Lot # S	20370011 N	2.0%			ertainty	ainty	 Nominal Conc. (µg/mL) Cor 	1000	38.D# [Cour		50		150		250
erial CRM こ 0子/0ら / 2と	olvent:	tric Acid	60.0 Nitric Aci	(IIII-)				Initial Final c. (µg/mL) Conc. (µg/n	0000.1 1000.0	ול] [Linear]		6) O		160		260
F		Hiovar	d Formulated By:	6	K	Reviewed By:	Fynandad	Uncertainty nL) +/- (µg/mL)	2.1 1			70 8		170 18		
		wi Espe	Giovanni	A	6 ten	Pedro L	SUS	(Solvent Safet) CAS# OSHA PE	0042-76-9 N			9 9 0		0 1 0		
ANAB ISO 17034 AR-1539 Certifica https://Absolutestar		ate.	Esposito 0730		ø	Rentas 0730	Information	y Info. On Attached pg.) EL (TWA) LD50	VA orl-rat 2750mg/k			100		200		
Accredited ate Number Idards.com			[≌]			2	Į	NIST	g 3153a					4,000,000,000,000,000,000,000,000,000,0		

Part # 57038 Lot # 073021

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Certified Reference Material CRM



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

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70.01	500	<0.02	10.02	200	<0.02	20.01	50	<0.02		c0 0>		· ·····		
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70.02	3	<0.02	-	7	40.2	20.02	3	<0.02	101	200				
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20.05	2	<0.02	20.02		<0.02	20.02		<0.02	20.02	200	Constant and the second second			And in the other data and the ot
4	4	Zn	Y		\$	<	: •	a	W	W I				
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(T)= Target analyte

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Part # 57038 Lot # 073021



1 of 2

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



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

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

Physical Characterization:

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

(T)= Target analyte

Certified by:

In P. Mr.

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

the preparation of all standards.

* All standard containers are meticulously cleaned prior to use.

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

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

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

Part # 58113 Lot # 070622

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

Certified Reference Material CRM



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

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

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Physical Characterization:

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

Certified by:

in M

* 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. 40

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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Absolute Standard 800-368-1131 www.absolutestandards.co	, Inc.	*		Certified Refer	ence Material	CRM		*	AI	IAB ISO 17(}-1539 Cert ;://Absolute:
Instrumental Analy	is by Inducti	ively Couple	Plasma Mass Sj	oectrometry (I	CP-MS):					
			Trace Me	tals Verifica	tion by ICP-	MS (µg/ml				
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Be <0.01 Cr Bi <0.02 Co B <0.02 Cu	<0.02 <0.02 A A A A A A A A A A A A A	40.02 3a <0.02 3e <0.02 41 <0.02	Ir <0.02 Fe <0.2 La <0.02 Pb <0.02	Mn <0.02 Hg <0.2 Mo <0.02 Nd <0.02	Pd <0.02 P <0.02 Pt <0.02 K <0.2	Rb <0.0	2 Na Na Na Na Na	<0.2 Th <0.02 Th <0.02 Sn <0.02 Ti	A 60.02	7. A0.0
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QUALITY ASSURANCE TECHNICAL SUPPORT LABORATORY "An ISO 9001:2015 Certified Program" R1. 02 / 20 / 20

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.

<u>CAUTION</u>: Read instructions carefully before opening bottle(s) and proceeding with the analyses.





(A) SAMPLE DESCRIPTION

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

(B) BREAKAGE OR MISSING ITEMS

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

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

(C) ANALYSIS OF SAMPLES

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

ICV1-1014 For ICP-AES 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



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

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



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

R: 02/20/20

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 $K_3Fe(CN)_6$, 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			
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	

Description: Bartum (Ba) Expiration Date: 072125 Nominal Concentration (gdy/m): 1000 Veight shown ballow was diluted to (mL): 2000.02 Unit Nominal Putty Uncentainty Assay Compound Number Conc. (gd/m1, 100 Notice (Ba) 1000 1. Barlum nitrate (Ba) 1.0 100 2.0 11 2.0 10 2.0 10 1.0 20 2.0 10 2.0 10 2.0 10 1.0 20 2.0 10 1.0 20 2.0 10 2.0 10 2.0 10 1.0 20 2.0 10 2.0 10 2.0 10 1.0 20 2.0 10 1.0 20 2.0 10 2.0 10 2.0 10 2.0 10 2.0 10 2.0 10 2.0 10 2.0 10 2.0 10 2.0 <t< th=""></t<>
Expiration Date: 072125 2% 4.0.0 Ninic Add Performanded Storage: Ambient (20 °C) 60.0 Ninic Add Weight shown balow wead diluted to (nL): 2000.02 0.058 Fasure luveriary 1000 Safurn nitrate (Ba) IN023 successes 1000 9.999 0.10 52.3 3.92417 3.82427 100 Safurn nitrate (Ba) IN023 successes 1000 9.999 0.10 52.3 3.92417 3.82428 100 1.0EE IN023 successes 1000 9.999 0.10 52.3 3.92417 3.82428 100 1.0EE IN023 successes 100.1 I 12.514 sacial-5.5# (Countril [Lineaar] 2.0EE 100 200 300 4/0 6/0 6/0 6/0 mix 100 200 300 4/0 5/0 6/0 6/0 s.onee 100 120 120 1300 140 150 16/0 s.onee 100 120 130 130 140 150 160 s.onee
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2.5E6 110 120 130 160 160
9.0E6 5.0E6 5.0E6 100 120 130 140 150 160
P S B B
m/z-> 210 220

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



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

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

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Physical Characterization:

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

Certified by:

ar M

- * 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).

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





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 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 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)	\leq 0.010 ppm	< 0.003 ppm	
Trace Impurities – Aluminum (Al)	\leq 10.0 ppb	< 0.2 ppb	
Arsenic and Antimony (as As)	\leq 5.0 ppb	< 3.0 ppb	
Trace Impurities – Barium (Ba)	\leq 1.0 ppb	< 0.2 ppb	
Trace Impurities – Beryllium (Be)	\leq 1.0 ppb	< 0.2 ppb	
Trace Impurities – Bismuth (Bi)	\leq 10.0 ppb	< 1.0 ppb	
Trace Impurities – Boron (B)	\leq 20.0 ppb	< 5.0 ppb	
Trace Impurities - Cadmium (Cd)	\leq 1.0 ppb	< 0.3 ppb	
Trace Impurities – Calcium (Ca)	≤ 50.0 ppb	37.0 ppb	
Trace Impurities – Chromium (Cr)	\leq 1.0 ppb	< 0.4 ppb	
Trace Impurities – Cobalt (Co)	\leq 1.0 ppb	< 0.3 ppb	
Trace Impurities – Copper (Cu)	\leq 1.0 ppb	< 0.1 ppb	
Trace Impurities – Gallium (Ga)	\leq 1.0 ppb	< 0.2 ppb	
Trace Impurities – Germanium (Ge)	\leq 3.0 ppb	< 2.0 ppb	
Trace Impurities - Gold (Au)	\leq 4.0 ppb	0.2 ppb	
Heavy Metals (as Pb)	\leq 100 ppb	< 50 ppb	
Trace Impurities – Iron (Fe)	\leq 15 ppb	1 ppb	

>>> Continued on page 2 >>>

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





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

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

>>> Continued on page 3 >>>

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





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

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

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

James Techie

Jamie Ethier Vice President Global Quality

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





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 (Cl)	≤ 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
>>> Continued on page 2 >>>		

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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

>>> Continued on page 3 >>>

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





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

Test	Specification	Result	

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

James Techie Jamie Ethier Vice President Global Quality

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

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Nitric Acid CMOS





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 (Cl)	≤ 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
>>> Continued on page 2 >>>		

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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

>>> Continued on page 3 >>>

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

Test	Specification	Result	

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

James Techie Jamie Ethier Vice President Global Quality

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





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 Cl2)	≤ 0.5 ppm	< 0.5 ppm
Phosphate (PO4)	≤ 0.05 ppm	< 0.03 ppm
Sulfate (SO4)	≤ 0.5 ppm	< 0.5 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)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Beryllium (Be)	\leq 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)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities – Calcium (Ca)	\leq 50.0 ppb	48.0 ppb
Trace Impurities - Chromium (Cr)	\leq 1.0 ppb	< 0.4 ppb
Trace Impurities - Cobalt (Co)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities - Copper (Cu)	\leq 1.0 ppb	< 0.1 ppb
Trace Impurities - Gallium (Ga)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities - Germanium (Ge)	\leq 3.0 ppb	< 2.0 ppb
Trace Impurities - Gold (Au)	\leq 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	\leq 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 15 ppb	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)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Magnesium (Mg)	\leq 10.0 ppb	0.7 ppb
Trace Impurities – Manganese (Mn)	\leq 1.0 ppb	< 0.4 ppb
Trace Impurities – Mercury (Hg)	\leq 0.5 ppb	< 0.1 ppb
Trace Impurities – Molybdenum (Mo)	\leq 10.0 ppb	< 5.0 ppb
Trace Impurities – Nickel (Ni)	\leq 4.0 ppb	< 0.3 ppb
Trace Impurities – Niobium (Nb)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Potassium (K)	≤ 9.0 ppb	< 2.0 ppb
Trace Impurities – Selenium (Se), For Information Only		< 1.0 ppb
Trace Impurities – Silicon (Si)	\leq 100.0 ppb	< 10.0 ppb
Trace Impurities – Silver (Ag)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities – Sodium (Na)	\leq 100.0 ppb	< 5.0 ppb
Trace Impurities – Strontium (Sr)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Tantalum (Ta)	\leq 1.0 ppb	< 0.9 ppb
Trace Impurities – Thallium (TI)	≤ 5.0 ppb	< 0.9 ppb
Trace Impurities – Tin (Sn)	≤ 5.0 ppb	< 0.8 ppb
Trace Impurities – Titanium (Ti)	\leq 1.0 ppb	0.3 ppb
Trace Impurities – Vanadium (V)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities – Zinc (Zn)	\leq 5.0 ppb	0.5 ppb
Trace Impurities – Zirconium (Zr)	\leq 1.0 ppb	< 0.1 ppb

>>> Continued on page 3 >>>

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





Material No.: 9530-33 Batch No.: 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 Packaging Site: Phillipsburg Mfg Ctr & DC

James Techie

Jamie Ethier Vice President Global Quality





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 (Cl)	≤ 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	1.2 ppb
Trace Impurities - Chromium (Cr)	≤ 30.0 ppb	1.7 ppb
Trace Impurities - Cobalt (Co)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Copper (Cu)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Gallium (Ga)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Germanium (Ge)	≤ 20 ppb	< 10 ppb
Trace Impurities - Gold (Au)	≤ 20 ppb	< 5 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities - Iron (Fe)	≤ 40.0 ppb	< 1.0 ppb
Trace Impurities - Lead (Pb)	≤ 20.0 ppb	< 10.0 ppb
Trace Impurities - Lithium (Li)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Magnesium (Mg)	≤ 20 ppb	< 1 ppb
Trace Impurities - Manganese (Mn)	≤ 10.0 ppb	< 1.0 ppb
Trace Impurities - Nickel (Ni)	≤ 20.0 ppb	< 5.0 ppb
>>> Continued on page 2 >>>		

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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 (Tl)	≤ 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

>>> Continued on page 3 >>>





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

Test	Specification	Result	

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

James Techie Jamie Ethier Vice President Global Quality

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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 (Cl)	≤ 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
>>> Continued on page 2 >>>		

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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 (Tl)	≤ 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

>>> Continued on page 3 >>>





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

Test	Specification	Result	

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

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





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 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 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)	\leq 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)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities - Calcium (Ca)	≤ 50.0 ppb	37.0 ppb
Trace Impurities – Chromium (Cr)	\leq 1.0 ppb	< 0.4 ppb
Trace Impurities - Cobalt (Co)	\leq 1.0 ppb	< 0.3 ppb
Trace Impurities - Copper (Cu)	\leq 1.0 ppb	< 0.1 ppb
Trace Impurities – Gallium (Ga)	\leq 1.0 ppb	< 0.2 ppb
Trace Impurities - Germanium (Ge)	\leq 3.0 ppb	< 2.0 ppb
Trace Impurities - Gold (Au)	\leq 4.0 ppb	0.2 ppb
Heavy Metals (as Pb)	≤ 100 ppb	< 50 ppb
Trace Impurities – Iron (Fe)	\leq 15 ppb	1 ppb

>>> Continued on page 2 >>>





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

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

>>> Continued on page 3 >>>

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





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

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

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

James Techie

Jamie Ethier Vice President Global Quality



Certificate of Analysis

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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, Cerium, Thallium,	Aluminum, Selenium,
	100 μg/mL ea: Lead,	Calcium,
	80 μg/mL ea: Arsenic,	
	70 μg/mL ea: Mercury,	
	50 μg/mL ea: Nickel,	
	40 μg/mL ea: Chromium,	
	30 µg/mL ea: Copper, Vanadium,	Boron,
	20 µg/mL ea: Zinc, Barium, Cadmium, Manganese,	Strontium, Beryllium, Cobalt, Lithium,
	7.5 μg/mL ea: Silver	

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE Aluminum, Al	CERTIFIED VALUE 200.0 ± 0.7 µg/mL	ANALYTE Arsenic, As	CERTIFIED VALUE 80.0 ± 0.5 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, Tl	200.0 ± 1.4 μg/mL	Vanadium, V	30.00 ± 0.13 μg/mL
Zinc, Zn	20.00 ± 0.09 µg/mL		

Density:

1.037 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
AI	ICP Assay	3101a	140903
AI	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
Be	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Са	ICP Assay	3109a	130213
Са	EDTA	928	928
Са	Calculated		See Sec. 4.2
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Се	ICP Assay	3110	090504
Се	EDTA	928	928
Со	ICP Assay	3113	190630
Со	EDTA	928	928
Со	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
Hq	ICP Assay	3133	061204
Hq	EDTA	928	928
ĸ	ICP Assay	3141a	140813
К	Gravimetric		See Sec. 4.2
Li	ICP Assay	3129a	100714
Li	Calculated		See Sec. 4.2
Li	Gravimetric		See Sec. 4.2
Ma	ICP Assav	3131a	140110
Ma	FDTA	928	928
Mn	ICP Assav	3132	050429
Mn	FDTA	928	928
Mn	Calculated		See Sec. 4.2
Na	ICP Assav	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assav	3136	120619
Ni	FDTA	928	928
Ni	Calculated		See Sec 4 2
P		3130a	060717
D	Acidimetric	841	8/1
I		UTL	046

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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	Certified Value, X _{CRMRM} , where one method of characterization
used is the weighted mean of the results:	is used is the mean of individual results:
$\begin{split} \textbf{X}_{\textbf{CRM/RM}} &= \boldsymbol{\Sigma}(\textbf{w}_i) \; (\textbf{X}_i) \\ \textbf{X}_i &= \text{mean of Assay Method i with standard uncertainty u_{char i} \\ \textbf{w}_i &= \text{the weighting factors for each method calculated using the inverse square of the variance:} \\ \textbf{w}_i &= (1/u_{char i})^2 / (\boldsymbol{\Sigma}(1/(u_{char i})^2)$	$X_{CRM/RM} = (X_a) (u_{char a})$ $X_a = mean of Assay Method A withu_{char a} = the standard uncertainty of characterization Method A$
CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{\frac{1}{2}}$	CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$
k = coverage factor = 2	k = coverage factor = 2
$u_{char} = [\Sigma((w_i)^2 (u_{char} i)^2)]^{\frac{1}{2}}$ where $u_{char} i$ 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
$u_{lts} = long term stability standard uncertainty (storage)$	$u_{tb} =$ long term stability standard uncertainty (storage)
$u_{ts} = transport stability standard uncertainty$	$u_{tb} =$ transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0

INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

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

Paul R Laines



CERTIFICATE OF ANALYSIS

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

1.0 ACCREDITATION / REGISTRATION

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



2.0 **PRODUCT DESCRIPTION**

Product Code:	Multi Analyte Custom Grade Solution		
Catalog Number:	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 Antimony, Sb	CERTIFIED VALUE 80.0 ± 0.6 μg/mL	ANALYTE Molybdenum, Mo	CERTIFIED VALUE 40.00 ± 0.17 µg/mL
Silica, SiO2	200.0 ± 1.5 μg/mL	Tin, Sn	70.0 ± 0.3 μg/mL

Titanium, Ti 20.00 ± 0.12 μg/mL

1.024 g/mL (measured at 20 \pm 4 °C)

Assay Information:

Density:

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
Ті	ICP Assay	3162a	130925
Ті	Calculated		See Sec. 4.2

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

Characterization of CRM/RM by Two or More Methods Characterization of CRM/RM by One Method Certified Value, X_{CRM/RM}, where two or more methods of characterization are Certified Value, $X_{CRM/RM}$, where one method of characterization used is the weighted mean of the results: is used is the mean of individual results: $X_{CRM/RM} = \Sigma(w_i) (X_i)$ $X_{CRM/RM} = (X_a) (u_{char a})$ X_i = mean of Assay Method i with standard uncertainty u_{char i} X_a = mean of Assay Method A with **w**_i = the weighting factors for each method calculated using the inverse square of uchar a = the standard uncertainty of characterization Method A the variance $w_i = (1/u_{char_i})^2 / (\Sigma(1/(u_{char_i})^2))$ CRM/RM Expanded Uncertainty (±) = U_{CRM/RM} = k (u²_{char} + u²_{bb} + u²_{lts} + u²_{ts})^{1/2} CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k (u^2_{char a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$ k = coverage factor = 2 k = coverage factor = 2 $\mathbf{u_{char}} = \left[\sum_{i} ((\mathbf{w}_i)^2 (\mathbf{u_{char}}_i)^2)\right]^{\frac{1}{2}}$ where $\mathbf{u_{char}}_i$ are the errors from each characterization method uchar a = the errors from characterization ubb = bottle to bottle homogeneity standard uncertainty ubb = bottle to bottle homogeneity standard uncertainty ults = long term stability standard uncertainty (storage) ults = long term stability standard uncertainty (storage) uts = transport stability standard uncertainty uts = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

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

4.1 Thermometer Calibration

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

4.2 Balance Calibration

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

4.3 Glassware Calibration

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

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

N/A

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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

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

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

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

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

8.0 HAZARDOUS INFORMATION

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

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

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

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

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

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 20, 2020

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

11.2 Lot Expiration Date

- May 20, 2024

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

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

11.3 Period of Validity

- Sealed TCT Bag Open Date: ____

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

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth Manager, Quality Control

Michael 2 Booth

Certifying Officer:

Paul Gaines CEO, Senior Technical Director

Prul R Line