spex®
certiprep

cientisol
soluciones científicas

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www.cientisol.com

Inorganic

certified reference materials

Welcome

Spex CertiPrep has been servicing the scientific community since 1954. We have grown into the industry's most passionate and reliable manufacturer of Certified Reference Materials (CRMs) and Calibration Standards for Analytical Spectroscopy and Chromatography.

We are pleased to share with you the latest and greatest Spex CertiPrep Certified Reference Materials catalog. This flip-book style catalog includes our Inorganic Certified Reference Materials on one side and Organic Certified Reference Materials on the other.

Our primary focus is to provide Inorganic and Organic CRMs of the highest quality and superior customer support. The Inorganic Standards are manufactured for AA, ICP, ICP-MS, IC, XRF, and other analytical instrumentation. The Organic Standards are manufactured for GC, GC/MS, HPLC, LC/MS, and other analytical instrumentation.

Spex CertiPrep Group is accredited by A2LA to ISO/IEC 17025:2017 and ISO 17034:2016 and by DQS to ISO 9001:2015. Our accreditation is the most comprehensive in the industry and encompasses all of our manufactured products.

Our Inorganic product line expands as technology improves. Ninety-nine percent of stock orders ship within 24-48 hours and custom standards are manufactured and shipped within 5 business days.

We are proud to offer many new and diverse Inorganic products in this catalog, including:

- Speciation Standards
- Carbon Black
- 1 ppm ICP-MS Single Element Standards
- USP <232>, <233> & <2232> Elemental Impurities
- Certified pH Buffers
- Multi-Element Standards for the latest EPA Methods
- European Methods

Our heritage is our passion for science and dedication to the analytical community.

We appreciate your business and look forward to working with you in the years to come.

4772A

OUR MISSION

Since 1954, we have been manufacturing Inorganic Certified Reference Materials (CRMs). SPEXInorganics® continues to lead the market with the highest quality products and an offering that spreads out into many market segments worldwide. We consistently strive to design and manufacture new products to meet or exceed the requirements set by the newest instrumentation and regulatory concerns. Our team of highly trained chemists work to provide 100% customer satisfaction.

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Ordering Information & Technical Support

Phone:	+1.732.549.7144 • 1.800.LAB.SPEX (1.800.522.7739)
Fax:	+1.732.603.9647
E-mail:	spexsales@antylia.com
Online Orders and Live Chat:	www.spex.com
Ask A Chemist:	AskAChemist@antylia.com
Mailing Address:	Spex CertiPrep • 203 Norcross Avenue • Metuchen, NJ 08840

TERMS & CONDITIONS

Payment terms are Net 30 days to rated organizations or payment can be made by credit card. Orders are shipped FCA Metuchen, New Jersey, and are shipped in accordance with IATA or DOT regulations. All freight charges are prepaid and added to the invoice unless otherwise specified on your order.

Contact our Sales Department for a Return Authorization Number and instructions before shipping. Unauthorized returns will be refused. Transportation is the responsibility of the customer; all materials must be packed, marked, labeled, and shipped in accordance with regulations governing transportation of hazardous materials, if applicable. Credit for returned merchandise will be issued only if goods are unopened, resalable and received within 30 days of the original invoice date. Returned items are subject to a 25% restocking fee.

Purchaser's sole and exclusive remedy for damages and seller's sole and exclusive liability for damages for any cause whatsoever, including alleged negligence, is limited to the refund of the purchase price of the product or replacement of the product at seller's election. In no event shall seller be liable for direct, indirect, incidental, or consequential damages, including lost profits.

Spex CertiPrep maintains authorized distributors in many countries around the world. Please visit the following web page at for a complete list of international distributors.

Spex CertiPrep products are not for any cosmetic, drug or household applications. Our acceptance of a purchase order is with the assumption that products will be used only by qualified individuals who are trained in appropriate procedures. Customers must ensure safe storage, handling and application of all products ordered from this catalog. We assume requisitioner's to be competent, safety-conscious professionals.

Spex CertiPrep offers Custom Certified Reference Materials because we realize that no two laboratories face exactly the same samples, or precisely the same requirements. In the real world, trace element determinations are performed in the presence of one or several major constituents, varying inter-element effects, matrix effects...the list goes on and on. These issues become increasingly important as you strive for greater reproducibility and push your technique to the limit and thereby require standards made specifically for your application.

With Spex CertiPrep's Custom Certified Reference Materials (CRMs) program, you can remove some of these variables. Select custom standards in connection with all product lines, from Single-Element and Multi-Element aqueous blends to Organometallic Oil Standards. Our sales specialists will be happy to discuss your applications/instrumentation, combination of elements, concentrations, and your preferred matrices. We will then design the most compatible, stable mixture using our comprehensive supply of starting materials and certified solutions. Simply tell us what standards you need and let our highly skilled chemists determine the optimum combinations for you.

Customized for your application

Certified by ICP, ICP-MS, LC-ICP-MS, or IC analysis

High quality starting materials tested for impurities prior to use

Over 60 years of experience in manufacturing custom CRMs

Manufactured and shipped within 5 business days

Dedicated technical support to answer your CRM and lab questions

Assurance® Grade Standards for AA and ICP

Claritas PPT® Grade Standards for ICP-MS

Speciation Standards for LC-ICP-MS

Ion Chromatography/Ion Selective Electrode Standards

Organometallic Oil Standards

Fusion Flux

Consumer Safety Compliance Standards

OUR GUARANTEE

We will guarantee your custom standards for one year from the date of shipment and supply your standard with a comprehensive Certificate of Analysis. For Claritas PPT® custom standards, we will include an impurity analysis on your Certificate of Analysis.

To get started, contact our technical sales team at 732.549.7144 or visit: **spex.com/CustomProduct/InorganicProduct** with the following information:

- Your specific application/instrumentation
- The concentration(s) at which you require each component
- The elements or complexes you desire
- The matrix which you prefer (e.g., water, dilute acid, oil, etc.)

To ensure the validity of results from today's high-performance instrumentation, Spex CertiPrep has developed an extensive line of the highest quality certified reference materials. How can we prove it? The International Organization for Standardization (ISO) has established a set of guidelines designed to define common business practices, increase responsibility and ensure clarity and full disclosure in the industry. As shown below, there are three ISO quality management systems that are most relevant for reference material manufacturers - ISO 9001, ISO/IEC 17025 and ISO 17034.

Each level has its own set of internationally recognized criteria against which companies are formally measured. Each level is more difficult to achieve and fewer companies are able to meet the required criteria. Spex CertiPrep is proud to be accredited for all three. By taking the extra step of choosing to demonstrate our competence and comply with these standards, we are continuously proving that our tests and calibration results are technically competent and our products truly are of the highest quality.

Levels of Accreditation - About Each Standard and What it Means to You

(all types of organizations)
Certified by UL-DQS as an ISO 9001:2015 facility for our Quality Management System

Open to all types of organizations • Written procedures • Documented complaints

(testing and/or calibration labs)
Accredited by A2LA as an ISO/IEC 17025:2017 Certified Chemical Testing Laboratory

Specifically for organizations carrying out testing and/or calibration • Competent at quality related tests • Consistent manufacturing

(reference material producers)
Accredited by A2LA as an ISO 17034:2016 Certified Inorganic and Organic Reference Material Producer

Specifically for reference material producers • Validate methods to prove accuracy • Report uncertainty and sources of error

Did you know that our purchased starting materials are double tested to assure what is put in our products is of the highest quality?

Every accredited manufacturer of Certified Reference Materials supplies a Certificate of Analysis (COA) with their products. ISO Guide 31 and ISO 17034 outline the information required for a Certificate of Analysis. In order to comply with the ISO standards, an accredited CRM manufacturer must supply more than a dozen informational and analytical values such as certifying bodies, material descriptions, intended use, instructions for use, homogeneity, stability, certified values and their uncertainties, and traceability. Not all certificates are alike. Spex CertiPrep has been supplying some of the most comprehensive Certificates of Analysis in the CRM industry for years. Our certificates are easy to read and have all of the information an analyst would need to use our standards. We have highlighted what you should look for in a Certificate of Analysis and why our certificate is one of the best.

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ACCREDITED Reference Materials Producer Cert. #2495.01 · ilac-MRA · ACCREDITED Chemical Testing Cert. #2495.02

Catalog Number: CLMS-2N **Lot No.** CL5-199MKBY
Description: Multi-element Solution 2
Matrix: 5% HNO3

The **CLARITAS PPT®** Certified Reference Material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICP-OES, DCP, AA, ICP-MS, and XRF. It can be employed in US EPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single-element concentrates of individual elements using Class A laboratory ware to give precise concentrations. See side 2 for details of certification.

Instrumental Analysis by ICP Spectrometer:

Analyte	Labeled	Certified	Uncertainty	SRM	Analyte	Labeled	Certified	Uncertainty	SRM
Ag	10 µg/mL	9.89 µg/mL	± 0.05 µg/mL	3151*	K	10 µg/mL	9.89 µg/mL	± 0.05 µg/mL	3141a*
Al	10 µg/mL	9.89 µg/mL	± 0.05 µg/mL	3101a*	Li	10 µg/mL	9.99 µg/mL	± 0.05 µg/mL	3129a*
As	10 µg/mL	9.92 µg/mL	± 0.05 µg/mL	3103a*	Mg	10 µg/mL	9.98 µg/mL	± 0.05 µg/mL	3131a*
Ba	10 µg/mL	9.98 µg/mL	± 0.05 µg/mL	3104a*	Mn	10 µg/mL	9.99 µg/mL	± 0.05 µg/mL	3132*
Be	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3105a*	Na	10 µg/mL	9.91 µg/mL	± 0.05 µg/mL	3152a*
Bi	10 µg/mL	9.97 µg/mL	± 0.05 µg/mL	3106*	Ni	10 µg/mL	9.95 µg/mL	± 0.05 µg/mL	3136*
Ca	10 µg/mL	9.94 µg/mL	± 0.05 µg/mL	3109a*	Pb	10 µg/mL	9.91 µg/mL	± 0.05 µg/mL	3128*
Cd	10 µg/mL	9.95 µg/mL	± 0.05 µg/mL	3108*	Rb	10 µg/mL	9.93 µg/mL	± 0.05 µg/mL	3145a*
Co	10 µg/mL	9.95 µg/mL	± 0.05 µg/mL	3113*	Se	10 µg/mL	9.98 µg/mL	± 0.05 µg/mL	3149*
Cr	10 µg/mL	9.93 µg/mL	± 0.05 µg/mL	3112a*	Sr	10 µg/mL	9.97 µg/mL	± 0.05 µg/mL	3153a*
Cs	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3111a*	Tl	10 µg/mL	9.88 µg/mL	± 0.05 µg/mL	3158*
Cu	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3114*	U	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3164*
Fe	10 µg/mL	10.3 µg/mL	± 0.05 µg/mL	3126a*	V	10 µg/mL	9.99 µg/mL	± 0.05 µg/mL	3165*
Ga	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3119a*	Zn	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3168a*
In	10 µg/mL	9.87 µg/mL	± 0.05 µg/mL	3124a*					

* - Indicates NIST SRM † - Indicates Spex CertiPrep CRM (when NIST SRM is not available)
Spex CertiPrep Reference Multi: Lot # CL3-151MKB, CL4-108MKB

Trace Metallic Impurities in the Actual Solution via ICP-MS Analysis:

Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL
Au	< 0.04	Ge	< 0.7	Mo	0.2	Re	< 0.01	Sm	0.9	Ti	< 6
B	< 2	Hf	< 0.08	Nb	< 0.06	Rh	0.7	Sn	< 0.9	Tm	0.05
Ce	0.1	Hg	< 0.2	Nd	< 0.01	Ru	< 1	Ta	< 0.1	W	< 0.3
Dy	< 0.01	Ho	< 0.01	P	< 200	Sb	< 0.04	Tb	< 2	Y	6
Er	< 0.01	Ir	0.08	Pd	< 5	Sc	< 0.4	Te	< 1	Yb	< 0.01
Eu	< 0.01	La	0.07	Pr	< 0.01	Si	< 200	Th	0.01	Zr	< 0.1
Gd	< 0.02	Lu	< 0.02	Pt	< 0.01						

Balances are calibrated regularly with weight sets traceable to NIST #s 32856, 32867 and others. This CRM is guaranteed stable and accurate to ± 0.5% of the certified value. This includes uncertainty components due to preparation, measurement, homogeneity, short-term, and long-term stability. No measured concentration of any individual component exceeds ± 2% of the labeled value. This guarantee is valid for a period of one year from the date of certification only when the material is unopened and stored under ambient labotatory conditions.

Date of Certification: _____ Certifying Officer: _____
Katherine Cullinan, QC Manager

Spex CertiPrep is accredited by A2LA for Inorganic and Organic Certified Reference Materials as complying with the requirements of ISO/IEC 17025 and ISO 17034 with the most comprehensive scope in the industry.

68 elements are scanned with ***found values*** for Claritas PPT® and Assurance® Standards.

Each elemental impurity listed with ***actual value*** - not limited to elements above detection limits.

Trace impurities of the ***final solution*** - not of the starting material.

Stability and accuracy of the ***final solution*** - not the starting materials.

Traceable to NIST.

Signed by Spex CertiPrep's Inorganic QC Manager.

Stamped with month and year of certification.

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To request product catalogs, please contact us or visit our website at .

spex sampleprep

Sample preparation is an important part of the quality control process. Spex SamplePrep's expertise and products can help analysts achieve accurate and consistent results by assuring reliable, reproducible samples.

Our sample preparation equipment products include cryogenic mills, cell lysers, pellet presses, ball mills, and automated fusion fluxers. We also provide XRF liquid cells, XRF window films and a selection of sample binders and grinding aids to simplify the sample preparation process. These products are used throughout the world in industrial, academic, research, and government laboratories. The uses cover many different fields of spectroscopy (XRF, ICP, ICP-MS, AA, IR) and their applications range from genetic research, forensics, geology, medicine, materials research, and agriculture.

We provide a Handbook of Sample Preparation and Handling that is known as a primary source of helpful advice for the preparation of samples. The topics covered in this handbook include grinding, pelletizing, fusion fluxing, and controlling contamination. Visit to learn more about our products, download the handbook or watch product demonstration videos.

spex® certiprep

section 1

- Made with acid and ASTM Type I Water
- Inorganic compounds and metals at 99.99& to 99.9999% purity (where commercially available)
- Directly traceable to NIST (where applicable)
- Certified by DQS to ISO 9001:2015
- Accredited by A2LA to ISO/IEC 17025:2017 and ISO 17034:2016

Assurance® Grade CRMs are designed for AA and ICP and are available in single and multi-element formulations. 70 elements are available as single-element standards and are available at 1,000 µg/mL and/or 10,000 µg/mL. They are packaged in 30 mL, 125 mL, 250 mL, and 500 mL bottles to minimize contamination. Custom standards can be manufactured upon request.

Assurance® Grade CRMs	
Designed For Use With	AA | ICP
Analytical Range For Use	ppm, ppb
Single-Element Standards	√
10 µg/mL	√ (Hg only)
1,000 µg/mL	√
10,000 µg/mL	√
Multi-Element Standards	√
Custom Standards	√
ISO 9001:2015	√
ISO/IEC 17025:2017	√
ISO 17034:2016	√
Traceable to NIST SRM (where applicable)	√
Acid Grade	High Purity Grade
# Trace Impurities Measured on Certificate of Analysis	68
Trace Impurities Measured to	µg/mL
30 mL	√
125 mL	√
250 mL	√
500 mL	√

Al
Aluminum

Atomic Number	13
Atomic Mass	26.982
Density	2.7 g/cm^3
Melting Point	660 °C
Boiling Point	2467 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLAL2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLAL2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLAL2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLAL2-2X
1,000 µg/mL	500 mL	2% HCl	PLAL1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLAL2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLAL2-3X
10,000 µg/mL	500 mL	5% HCl	PLAL1-3X

As
Arsenic

Atomic Number	33
Atomic Mass	74.922
Density	5.727 g/cm^3
Melting Point	817 °C
Boiling Point	614 °C*

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLAS2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLAS2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLAS2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLAS2-2X
1,000 µg/mL	500 mL	2% HCl	PLAS1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLAS2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLAS2-3X

** Sublimation Point.*

Be
Beryllium

Atomic Number	4
Atomic Mass	9.012
Density	1.848 g/cm^3
Melting Point	1287 °C
Boiling Point	2471 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLBE2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLBE2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLBE2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLBE2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLBE2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLBE2-3X

Sb
Antimony

Atomic Number	51
Atomic Mass	121.760
Density	6.697 g/cm^3
Melting Point	630 °C
Boiling Point	1587 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.6% Tartaric Acid/tr. HNO_3	PLSB7-2M
1,000 µg/mL	125 mL	H_2O/0.6% Tartaric Acid/tr. HNO_3	PLSB7-2Y
1,000 µg/mL	250 mL	H_2O/0.6% Tartaric Acid/tr. HNO_3	PLSB7-2T
1,000 µg/mL	500 mL	H_2O/0.6% Tartaric Acid/tr. HNO_3	PLSB7-2X
1,000 µg/mL	500 mL	20% HCl	PLSB5-2X
10,000 µg/mL	125 mL	H_2O/0.6% Tartaric Acid/1% HNO_3	PLSB7-3Y
10,000 µg/mL	500 mL	H_2O/0.6% Tartaric Acid/1% HNO_3	PLSB7-3X

Ba
Barium

Atomic Number	56
Atomic Mass	137.327
Density	3.51 g/cm^3
Melting Point	727 °C
Boiling Point	1897 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLBA2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLBA2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLBA2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLBA2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLBA2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLBA2-3X

Bi
Bismuth

Atomic Number	83
Atomic Mass	208.980
Density	9.78 g/cm^3
Melting Point	271 °C
Boiling Point	1564 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HNO_3	PLBI4-2M
1,000 µg/mL	125 mL	10% HNO_3	PLBI4-2Y
1,000 µg/mL	500 mL	10% HNO_3	PLBI4-2X

B
Boron

Atomic Number	5
Atomic Mass	10.811
Density	2.46 g/cm^3
Melting Point	2075 °C
Boiling Point	4000 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O	PLB9-2M
1,000 µg/mL	125 mL	H_2O	PLB9-2Y
1,000 µg/mL	250 mL	H_2O	PLB9-2T
1,000 µg/mL	500 mL	H_2O	PLB9-2X
10,000 µg/mL	125 mL	H_2O	PLB9-3Y
10,000 µg/mL	500 mL	H_2O	PLB9-3X

Cd
Cadmium

Atomic Number	48
Atomic Mass	112.411
Density	8.65 g/cm^3
Melting Point	321 °C
Boiling Point	767 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLCD2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLCD2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLCD2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLCD2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLCD2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLCD2-3X

Ca
Calcium

Atomic Number	20
Atomic Mass	40.078
Density	1.55 g/cm^3
Melting Point	842 °C
Boiling Point	1484 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLCA2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLCA2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLCA2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLCA2-2X
1,000 µg/mL	500 mL	2% HCl	PLCA1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLCA2-3Y
10,000 µg/mL	250 mL	5% HNO_3	PLCA2-3T
10,000 µg/mL	500 mL	5% HNO_3	PLCA2-3X
10,000 µg/mL	500 mL	5% HCl	PLCA1-3X

C
Carbon

Atomic Number	6
Atomic Mass	12.011
Density	2.26 g/cm^3
Melting Point	3550 °C*
Boiling Point	3825 °C*

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O	PLC9-2M
1,000 µg/mL	125 mL	H_2O	PLC9-2Y
1,000 µg/mL	500 mL	H_2O	PLC9-2X

** Numbers provided are for graphite. Carbon sublimates at -78.5°C.*

Ce
Cerium

Atomic Number	58
Atomic Mass	140.116
Density	6.689 g/cm^3
Melting Point	798 °C
Boiling Point	3424 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLCE2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLCE2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLCE2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLCE2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLCE2-3X

Cs
Cesium

Atomic Number	55
Atomic Mass	132.905
Density	1.879 g/cm^3
Melting Point	28 °C
Boiling Point	671 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLCS2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLCS2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLCS2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLCS2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLCS2-3X

Cr
Chromium

Atomic Number	24
Atomic Mass	51.996
Density	7.14 g/cm^3
Melting Point	1907 °C
Boiling Point	2671 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLCR2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLCR2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLCR2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLCR2-2X
1,000 µg/mL	500 mL	2% HCl	PLCR1-2X
1,000 µg/mL	500 mL	H_2O	PLCR9-2X
10,000 µg/mL	125 mL	5% HNO_3	PLCR2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLCR2-3X
10,000 µg/mL	500 mL	H_2O	PLCR9-3X

Co
Cobalt

Atomic Number	27
Atomic Mass	58.933
Density	8.9 g/cm^3
Melting Point	1495 °C
Boiling Point	2927 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLCO2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLCO2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLCO2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLCO2-2X
1,000 µg/mL	500 mL	2% HCl	PLCO1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLCO2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLCO2-3X

Cu
Copper

Atomic Number	29
Atomic Mass	63.546
Density	8.92 g/cm^3
Melting Point	1084 °C
Boiling Point	2562 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLCU2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLCU2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLCU2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLCU2-2X
1,000 µg/mL	500 mL	2% HCl	PLCU1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLCU2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLCU2-3X
10,000 µg/mL	500 mL	5% HCl	PLCU1-3X

Dy
Dysprosium

Atomic Number	66
Atomic Mass	162.5
Density	8.551 g/cm^3
Melting Point	1412 °C
Boiling Point	2567 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLDY2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLDY2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLDY2-2X

Er
Erbium

Atomic Number	68
Atomic Mass	167.259
Density	9.066 g/cm^3
Melting Point	1529 °C
Boiling Point	2868 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLER2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLER2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLER2-2X

Eu
Europium

Atomic Number	63
Atomic Mass	151.964
Density	5.244 g/cm^3
Melting Point	822 °C
Boiling Point	1529 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLEU2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLEU2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLEU2-2X

Gd
Gadolinium

Atomic Number	64
Atomic Mass	157.25
Density	7.9 g/cm^3
Melting Point	1312 °C
Boiling Point	3266 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLGD2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLGD2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLGD2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLGD2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLGD2-3X

Ga
Gallium

Atomic Number	31
Atomic Mass	69.723
Density	5.904 g/cm^3
Melting Point	30 °C
Boiling Point	2204 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLGA2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLGA2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLGA2-2X

Ge
Germanium

Atomic Number	32
Atomic Mass	72.63
Density	5.323 g/cm^3
Melting Point	938 °C
Boiling Point	2833 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.16% F^-	PLGE9-2M
1,000 µg/mL	125 mL	H_2O/0.16% F^-	PLGE9-2Y
1,000 µg/mL	500 mL	H_2O/0.16% F^-	PLGE9-2X

Au
Gold

Atomic Number	79
Atomic Mass	196.967
Density	19.3 g/cm^3
Melting Point	1064 °C
Boiling Point	2970 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HCl	PLAU3-2M
1,000 µg/mL	125 mL	10% HCl	PLAU3-2Y
1,000 µg/mL	500 mL	10% HCl	PLAU3-2X

Hf
Hafnium

Atomic Number	72
Atomic Mass	178.49
Density	13.31 g/cm^3
Melting Point	2233 °C
Boiling Point	4603 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HCl	PLHF1-2M
1,000 µg/mL	125 mL	2% HCl	PLHF1-2Y
1,000 µg/mL	500 mL	2% HCl	PLHF1-2X

Ho
Holmium

Atomic Number	67
Atomic Mass	164.930
Density	8.795 g/cm^3
Melting Point	1461 °C
Boiling Point	2720 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLHO2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLHO2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLHO2-2X

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In
Indium

Atomic Number	49
Atomic Mass	114.818
Density	7.31 g/cm^3
Melting Point	157 °C
Boiling Point	2072 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLIN2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLIN2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLIN2-2X

Fe
Iron

Atomic Number	26
Atomic Mass	55.845
Density	7.874 g/cm^3
Melting Point	1538 °C
Boiling Point	2861 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLFE2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLFE2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLFE2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLFE2-2X
1,000 µg/mL	500 mL	2% HCl	PLFE1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLFE2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLFE2-3X
10,000 µg/mL	500 mL	5%HCl	PLFE1-3X

Ir
Iridium

Atomic Number	77
Atomic Mass	192.217
Density	22.56 g/cm^3
Melting Point	2446 °C
Boiling Point	4428 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HCl	PLIR3-2M
1,000 µg/mL	125 mL	10% HCl	PLIR3-2Y
1,000 µg/mL	500 mL	10% HCl	PLIR3-2X

La
Lanthanum

Atomic Number	57
Atomic Mass	138.905
Density	6.146 g/cm^3
Melting Point	920 °C
Boiling Point	3464 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLLA2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLLA2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLLA2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLLA2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLLA2-3X

Pb
Lead

Atomic Number	82
Atomic Mass	207.2
Density	11.34 g/cm^3
Melting Point	327 °C
Boiling Point	1749 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLPB2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLPB2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLPB2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLPB2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLPB2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLPB2-3X

Li
Lithium

Atomic Number	3
Atomic Mass	6.941
Density	0.535 g/cm^3
Melting Point	181 °C
Boiling Point	1342 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLLI2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLLI2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLLI2-2X
1,000 µg/mL	500 mL	2% HCl	PLLI1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLLI2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLLI2-3X
10,000 µg/mL	500 mL	5% HCl	PLLI1-3X

Lu
Lutetium

Atomic Number	71
Atomic Mass	174.967
Density	9.841 g/cm^3
Melting Point	1663 °C
Boiling Point	3402 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLLU2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLLU2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLLU2-2X

Mg
Magnesium

Atomic Number	12
Atomic Mass	24.305
Density	1.738 g/cm^3
Melting Point	650 °C
Boiling Point	1090 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLMG2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLMG2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLMG2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLMG2-2X
1,000 µg/mL	500 mL	2% HCl	PLMG1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLMG2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLMG2-3X
10,000 µg/mL	500 mL	5% HCl	PLMG1-3X

Mn
Manganese

Atomic Number	25
Atomic Mass	54.938
Density	7.47 g/cm^3
Melting Point	1247 °C
Boiling Point	2061 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLMN2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLMN2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLMN2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLMN2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLMN2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLMN2-3X

Hg
Mercury

Atomic Number	80
Atomic Mass	200.59
Density	13.534 g/cm^3
Melting Point	-39 °C
Boiling Point	356 °C

Concentration	Volume	Matrix	Part #
10 µg/mL	125 mL	5% HNO_3	PLHG2-1AY
10 µg/mL	500 mL	5% HNO_3	PLHG2-1AX
100 µg/mL	125 mL	5% HNO_3	PLHG2-1Y
100 µg/mL	500 mL	5% HNO_3	PLHG2-1X
1,000 µg/mL	30 mL	10% HNO_3	PLHG4-2M
1,000 µg/mL	125 mL	10% HNO_3	PLHG4-2Y
1,000 µg/mL	250 mL	10% HNO_3	PLHG4-2T
1,000 µg/mL	500 mL	10% HNO_3	PLHG4-2X
10,000 µg/mL	125 mL	10% HNO_3	PLHG4-3Y
10,000 µg/mL	500 mL	10% HNO_3	PLHG4-3X

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Mo
Molybdenum

Atomic Number	42
Atomic Mass	95.96
Density	10.28 g/cm^3
Melting Point	2623 °C
Boiling Point	4639 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O	PLMO9-2M
1,000 µg/mL	125 mL	H_2O	PLMO9-2Y
1,000 µg/mL	250 mL	H_2O	PLMO9-2T
1,000 µg/mL	500 mL	H_2O	PLMO9-2X
10,000 µg/mL	125 mL	H_2O	PLMO9-3Y
10,000 µg/mL	500 mL	H_2O	PLMO9-3X

Nd
Neodymium

Atomic Number	60
Atomic Mass	144.242
Density	7.01 g/cm^3
Melting Point	1024 °C
Boiling Point	3074 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLND2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLND2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLND2-2X

Ni
Nickel

Atomic Number	28
Atomic Mass	58.693
Density	8.908 g/cm^3
Melting Point	1455 °C
Boiling Point	2913 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLNI2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLNI2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLNI2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLNI2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLNI2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLNI2-3X

Nb
Niobium

Atomic Number	41
Atomic Mass	92.906
Density	8.57 g/cm^3
Melting Point	2477 °C
Boiling Point	4744 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.4% HF	PLNB9-2M
1,000 µg/mL	125 mL	H_2O/0.4% HF	PLNB9-2Y
1,000 µg/mL	500 mL	H_2O/0.4% HF	PLNB9-2X
10,000 µg/mL	125 mL	H_2O/0.4% HF	PLNB9-3Y
10,000 µg/mL	500 mL	H_2O/0.4% HF	PLNB9-3X

Pd
Palladium

Atomic Number	46
Atomic Mass	106.42
Density	12.023 g/cm^3
Melting Point	1555 °C
Boiling Point	2963 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HCl	PLPD3-2M
1,000 µg/mL	125 mL	10% HCl	PLPD3-2Y
1,000 µg/mL	500 mL	10% HCl	PLPD3-2X

P
Phosphorus

Atomic Number	15
Atomic Mass	30.974
Density	1.823 g/cm^3
Melting Point	44 °C
Boiling Point	277 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O	PLP9-2M
1,000 µg/mL	125 mL	H_2O	PLP9-2Y
1,000 µg/mL	250 mL	H_2O	PLP9-2T
1,000 µg/mL	500 mL	H_2O	PLP9-2X
10,000 µg/mL	125 mL	H_2O	PLP9-3Y
10,000 µg/mL	500 mL	H_2O	PLP9-3X

Pt
Platinum

Atomic Number	78
Atomic Mass	195.064
Density	21.09 g/cm^3
Melting Point	1768 °C
Boiling Point	3825 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HCl	PLPT3-2M
1,000 µg/mL	125 mL	10% HCl	PLPT3-2Y
1,000 µg/mL	500 mL	10% HCl	PLPT3-2X

K
Potassium

Atomic Number	19
Atomic Mass	39.098
Density	0.856 g/cm^3
Melting Point	63 °C
Boiling Point	759 °C

Concentration	Volume	Matrix	Part #1,000
1,000 µg/mL	30 mL	2% HNO_3	PLK2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLK2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLK2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLK2-2X
1,000 µg/mL	500 mL	2% HCl	PLK1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLK2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLK2-3X
10,000 µg/mL	500 mL	5% HCl	PLK1-3X

Pr
Praseodymium

Atomic Number	59
Atomic Mass	140.908
Density	6.64 g/cm^3
Melting Point	935 °C
Boiling Point	3520 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLPR2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLPR2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLPR2-2X

Re
Rhenium

Atomic Number	75
Atomic Mass	186.207
Density	21.02 g/cm^3
Melting Point	3186 °C
Boiling Point	5596 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O	PLRE9-2M
1,000 µg/mL	125 mL	H_2O	PLRE9-2Y
1,000 µg/mL	500 mL	H_2O	PLRE9-2X

Rh
Rhodium

Atomic Number	45
Atomic Mass	102.905
Density	12.45 g/cm^3
Melting Point	1964 °C
Boiling Point	3695 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HCl	PLRH3-2M
1,000 µg/mL	125 mL	10% HCl	PLRH3-2Y
1,000 µg/mL	500 mL	10% HCl	PLRH3-2X

Rb
Rubidium

Atomic Number	37
Atomic Mass	85.467
Density	1.532 g/cm^3
Melting Point	39 °C
Boiling Point	688 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLRB2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLRB2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLRB2-2X

Ru
Ruthenium

Atomic Number	44
Atomic Mass	101.07
Density	12.37 g/cm^3
Melting Point	2334 °C
Boiling Point	4150 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HCl	PLRU3-2M
1,000 µg/mL	125 mL	10% HCl	PLRU3-2Y
1,000 µg/mL	500 mL	10% HCl	PLRU3-2X

Sm
Samarium

Atomic Number	62
Atomic Mass	150.36
Density	7.353 g/cm^3
Melting Point	1072 °C
Boiling Point	1790 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLSM2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLSM2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLSM2-2X

Sc
Scandium

Atomic Number	21
Atomic Mass	44.956
Density	2.985 g/cm^3
Melting Point	1541 °C
Boiling Point	2836 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLSC2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLSC2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLSC2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLSC2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLSC2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLSC2-3X

Se
Selenium

Atomic Number	34
Atomic Mass	78.96
Density	4.819 g/cm^3
Melting Point	221 °C
Boiling Point	685 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLSE2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLSE2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLSE2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLSE2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLSE2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLSE2-3X

Si
Silicon

Atomic Number	14
Atomic Mass	28.085
Density	2.33 g/cm^3
Melting Point	1414 °C
Boiling Point	3265 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.4% F^-	PLSI9-2M
1,000 µg/mL	125 mL	H_2O/0.4% F^-	PLSI9-2Y
1,000 µg/mL	250 mL	H_2O/0.4% F^-	PLSI9-2T
1,000 µg/mL	500 mL	H_2O/0.4% F^-	PLSI9-2X
1,000 µg/mL	500 mL	H_2O	PLSI9A-2X
10,000 µg/mL	125 mL	H_2O/4% F^-	PLSI9-3Y
10,000 µg/mL	500 mL	H_2O/4% F^-	PLSI9-3X
10,000 µg/mL	500 mL	H_2O	PLSI9A-3X

Ag
Silver

Atomic Number	47
Atomic Mass	107.868
Density	10.49 g/cm^3
Melting Point	962 °C
Boiling Point	2162 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLAG2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLAG2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLAG2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLAG2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLAG2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLAG2-3X

Na
Sodium

Atomic Number	11
Atomic Mass	22.989
Density	0.968 g/cm^3
Melting Point	98 °C
Boiling Point	883 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLNA2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLNA2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLNA2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLNA2-2X
1,000 µg/mL	500 mL	2% HCl	PLNA1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLNA2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLNA2-3X
10,000 µg/mL	500 mL	5% HCl	PLNA1-3X

Sr
Strontium

Atomic Number	38
Atomic Mass	87.62
Density	2.63 g/cm^3
Melting Point	777 °C
Boiling Point	1382 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLSR2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLSR2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLSR2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLSR2-2X
1,000 µg/mL	500 mL	2% HCl	PLSR1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLSR2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLSR2-3X

S
Sulfur

Atomic Number	16
Atomic Mass	32.065
Density	1.96 g/cm^3
Melting Point	115 °C
Boiling Point	445 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O	PLS9-2M
1,000 µg/mL	125 mL	H_2O	PLS9-2Y
1,000 µg/mL	250 mL	H_2O	PLS9-2T
1,000 µg/mL	500 mL	H_2O	PLS9-2X
10,000 µg/mL	125 mL	H_2O	PLS9-3Y
10,000 µg/mL	500 mL	H_2O	PLS9-3X

Ta
Tantalum

Atomic Number	73
Atomic Mass	180.947
Density	16.65 g/cm^3
Melting Point	3017 °C
Boiling Point	5458 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.8% HF	PLTA9-2M
1,000 µg/mL	125 mL	H_2O/0.8% HF	PLTA9-2Y
1,000 µg/mL	500 mL	H_2O/0.8% HF	PLTA9-2X
10,000 µg/mL	125 mL	H_2O/0.8% HF	PLTA9-3Y
10,000 µg/mL	500 mL	H_2O/0.8% HF	PLTA9-3X

Te
Tellurium

Atomic Number	52
Atomic Mass	127.6
Density	6.24 g/cm^3
Melting Point	449 °C
Boiling Point	988 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	10% HNO_3	PLTE4-2M
1,000 µg/mL	125 mL	10% HNO_3	PLTE4-2Y
1,000 µg/mL	500 mL	10% HNO_3	PLTE4-2X

Tb
Terbium

Atomic Number	65
Atomic Mass	158.925
Density	8.219 g/cm^3
Melting Point	1356 °C
Boiling Point	3230 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLTB2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLTB2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLTB2-2X

Tl
Thallium

Atomic Number	81
Atomic Mass	204.383
Density	11.85 g/cm^3
Melting Point	304 °C
Boiling Point	1473 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLTL2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLTL2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLTL2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLTL2-2X

Th
Thorium (Depleted)

Atomic Number	90
Atomic Mass	232.038
Density	11.724 g/cm^3
Melting Point	1842 °C
Boiling Point	4788 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLTH2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLTH2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLTH2-2X

Tm
Thulium

Atomic Number	69
Atomic Mass	168.934
Density	9.321 g/cm^3
Melting Point	1545 °C
Boiling Point	1950 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLTM2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLTM2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLTM2-2X

Sn
Tin

Atomic Number	50
Atomic Mass	118.71
Density	7.31 g/cm^3
Melting Point	232 °C
Boiling Point	2602 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	20% HCl	PLSN5-2M
1,000 µg/mL	125 mL	20% HCl	PLSN5-2Y
1,000 µg/mL	250 mL	20% HCl	PLSN5-2T
1,000 µg/mL	500 mL	20% HCl	PLSN5-2X
1,000 µg/mL	500 mL	1% HNO_3/1% HF	PLSN2-2X
10,000 µg/mL	125 mL	20% HCl	PLSN5-3Y
10,000 µg/mL	500 mL	20% HCl	PLSN5-3X
10,000 µg/mL	500 mL	2% HNO_3/2% HF	PLSN2-3X

Ti
Titanium

Atomic Number	22
Atomic Mass	47.857
Density	4.507 g/cm^3
Melting Point	1668 °C
Boiling Point	3287 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.24% F^-	PLTI9-2M
1,000 µg/mL	125 mL	H_2O/0.24% F^-	PLTI9-2Y
1,000 µg/mL	250 mL	H_2O/0.24% F^-	PLTI9-2T
1,000 µg/mL	500 mL	H_2O/0.24% F^-	PLTI9-2X
1,000 µg/mL	500 mL	20% HCl	PLTI5-2X
10,000 µg/mL	125 mL	H_2O/2.4% F^-	PLTI9-3Y
10,000 µg/mL	500 mL	H_2O/2.4% F^-	PLTI9-3X
10,000 µg/mL	500 mL	40% HCl	PLTI5-3X

W
Tungsten

Atomic Number	74
Atomic Mass	183.84
Density	19.25 g/cm^3
Melting Point	3422 °C
Boiling Point	5555 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O	PLW9-2M
1,000 µg/mL	125 mL	H_2O	PLW9-2Y
1,000 µg/mL	500 mL	H_2O	PLW9-2X
1,000 µg/mL	500 mL	1% HNO_3/2% HF	PLW2-2X
10,000 µg/mL	125 mL	H_2O	PLW9-3Y
10,000 µg/mL	500 mL	H_2O	PLW9-3X
10,000 µg/mL	500 mL	2% HNO_3/5% HF	PLW2-3X

U
Uranium (Depleted)

Atomic Number	92
Atomic Mass	238.027
Density	19.05 g/cm^3
Melting Point	1132 °C
Boiling Point	4131 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLU2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLU2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLU2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLU2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLU2-3X

V
Vanadium

Atomic Number	23
Atomic Mass	50.941
Density	6.11 g/cm^3
Melting Point	1910 °C
Boiling Point	3407 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLV2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLV2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLV2-2X
1,000 µg/mL	500 mL	2%HCl	PLV1-2X
10,000 µg/mL	125 mL	15% HNO_3	PLV4-3Y
10,000 µg/mL	500 mL	15% HNO_3	PLV4-3X
10,000 µg/mL	500 mL	15% HCl	PLV3-3X

Yb
Ytterbium

Atomic Number	70
Atomic Mass	173.054
Density	6.57 g/cm^3
Melting Point	824 °C
Boiling Point	1196 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLYB2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLYB2-2Y
1,000 µg/mL	500 mL	2% HNO_3	PLYB2-2X

Y
Yttrium

Atomic Number	39
Atomic Mass	88.906
Density	4.472 g/cm^3
Melting Point	1526 °C
Boiling Point	3336 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLY2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLY2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLY2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLY2-2X
10,000 µg/mL	125 mL	5% HNO_3	PLY2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLY2-3X

Zn
Zinc

Atomic Number	30
Atomic Mass	65.38
Density	7.14 g/cm^3
Melting Point	419 °C
Boiling Point	907 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLZN2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLZN2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLZN2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLZN2-2X
1,000 µg/mL	500 mL	2% HCl	PLZN1-2X
10,000 µg/mL	125 mL	5% HNO_3	PLZN2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLZN2-3X
10,000 µg/mL	500 mL	5% HCl	PLZN1-3X

Zr
Zirconium

Atomic Number	40
Atomic Mass	91.224
Density	6.511 g/cm^3
Melting Point	1855 °C
Boiling Point	4409 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	PLZR2-2M
1,000 µg/mL	125 mL	2% HNO_3	PLZR2-2Y
1,000 µg/mL	250 mL	2% HNO_3	PLZR2-2T
1,000 µg/mL	500 mL	2% HNO_3	PLZR2-2X
1,000 µg/mL	500 mL	10% HCl	PLZR3-2X
10,000 µg/mL	125 mL	5% HNO_3	PLZR2-3Y
10,000 µg/mL	500 mL	5% HNO_3	PLZR2-3X
10,000 µg/mL	500 mL	10% HCl	PLZR3-3X

May be used to dilute your multi-element standards or can be run directly as a blank to establish your base line. Do not use any acid or water as a diluent if you are not certain of its purity.

Element	Volume	Matrix	Part #
Nitric Acid Blank	500 mL	5% HNO_3	PLBLK-HNO3
Hydrochloric Acid Blank	500 mL	5% HCl	PLBLK-HCL
DI Water Blank	500 mL	H_2O	PLBLK-H2O
DI Water Blank	1 L	H_2O	PLBLK-H2O-1L
DI Water Blank	2 L	H_2O	PLBLK-H2O-2L
DI Water Blank	4 L	H_2O	PLBLK-H2O-4L

Assurance® Grade, Set of 38 Single-Element Standards.

Element	Concentration	Volume	Matrix	Part #
Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, Pb, Sc, Se, Sr, Tl, V, Y, Zn, Zr	1,000 µg/mL each	125 mL each	2% HNO_3	ICP-KIT-1
Bi, Hg			10% HNO_3	
Sn			20% HCl	
B, Mo, P, S, W			H_2O	
Sb			H_2O/0.6% Tartaric Acid/tr. HNO_3	
Ti			H_2O/0.24% F^-	
Nb, Si			H_2O/0.4% F^-	

Units of Measurement

Common Unit Prefixes								
Prefix	*kilo*	*centi*	*milli*	*micro*	*nano*	*pico*	*femto*	*atto*
Symbol	k	c	m	µ	n	p	f	a
Factor	10^{3}	10^{-2}	10^{-3}	10^{-6}	10^{-9}	10^{-12}	10^{-15}	10^{-18}
Equivalence	thousand	hundredth	thousandth	millionth	billionth	trillionth	quadrillionth	quintillionth

Weight to Weight Concentrations					
Name	*Symbol*	*Equivalence*			
*Parts per thousand **	ppt*	g/kg	mg/g	µg/mg	ng/µg
Parts per million	ppm	mg/kg	µg/g	ng/mg	pg/µg
Parts per billion	ppb	µg/kg	ng/g	pg/mg	fg/µg
*Parts per trillion ***	ppt**	ng/kg	pg/g	fg/mg	ag/µg

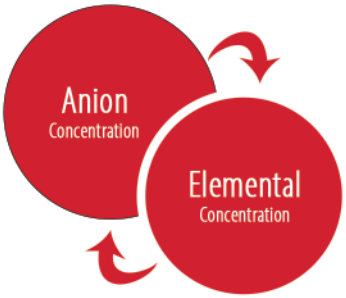
Weight to Volume Concentrations					
Name	*Symbol*	*Equivalence*			
*Parts per thousand **	ppt*	g/L	mg/mL	µg/µL	ng/nL
Parts per million	ppm	mg/L	µg/mL	ng/µL	pg/nL
Parts per billion	ppb	µg/L	ng/mL	pg/µL	fg/nL
*Parts per trillion ***	ppt**	ng/L	pg/mL	fg/µL	ag/nL

Concentration Conversions					
Unit	*Symbol*	*ppt**	*ppm*	*ppb*	*ppt***
*1 part per thousand **	ppt*	-	1×10^{3}	1×10^{6}	1×10^{9}
1 part per million	ppm	1×10^{-3}	-	1×10^{3}	1×10^{6}
1 part per billion	ppb	1×10^{-6}	1×10^{-3}	-	1×10^{3}
*1 part per trillion ***	ppt**	1×10^{-9}	1×10^{-6}	1×10^{-3}	-

** ppt = parts per thousand*
*** ppt = parts per trillion*

Temperature Scale			
Scale	*Symbol*	*Convert To*	*Formula*
Celsius	°C	Fahrenheit	°F = °C x 1.8 + 32
Celsius	°C	Kelvin	°K = °C + 273
Fahrenheit	°F	Celsius	°C = (°F - 32) / 1.8
Fahrenheit	°F	Kelvin	°K = (°F - 32) / 1.8 + 273
Kelvin	°K	Celsius	°C = °K - 273
Kelvin	°K	Fahrenheit	°F = 1.8 (°K - 273) + 32

Helpful Hint: When calculating gravimetric factors for Ion Chromatography standards, remember that:



Anion Concentration		Elemental Concentration
1,000 µg/mL Nitrate	=	226 µg/mL Nitrogen
1,000 µg/mL Nitrite	=	305 µg/mL Nitrogen
1,000 µg/mL Phosphate	=	326 µg/mL Phosphorus
1,000 µg/mL Sulfate	=	334 µg/mL Sulfur
1,000 µg/mL Nitrogen as Nitrate	=	1,000 µg/mL Nitrogen
1,000 µg/mL Nitrogen as Nitrite	=	1,000 µg/mL Nitrogen
1,000 µg/mL Phosphorus as Phosphate	=	1,000 µg/mL Phosphorus
1,000 µg/mL Sulfur as Sulfate	=	1,000 µg/mL Sulfur

spex®
certiprep

section 2

Speciation Standards

Speciation analysis has become common in many fields, including environmental, food and pharmaceutical testing labs. To analyze species within a sample requires Certified Reference Materials (CRMs) for sample verification and method validation. Many speciation standards are available in today's market, however, most of them are not certified or analyzed with a state-of-the-art ICP, ICP-MS or LC-ICP-MS. Spex CertiPrep offers a wide variety of speciation standards, certified to the strictest ISO 17034 guidelines, and tested on our own LC-ICP-MS.

Elements	Concentration	Volume	Matrix	Part #
Arsenic +3	1,000 µg/mL	30 mL	2% HCl	SPEC-AS3M
Arsenic +3	1,000 µg/mL	125 mL	2% HCl	SPEC-AS3
Arsenic +5	1,000 µg/mL	30 mL	H_2O	SPEC-AS5M
Arsenic +5	1,000 µg/mL	125 mL	H_2O	SPEC-AS5
Chromium +3	1,000 µg/mL	30 mL	2% HNO_3	SPEC-CR3M
Chromium +3	1,000 µg/mL	125 mL	2% HNO_3	SPEC-CR3
Chromium +6	1,000 µg/mL	30 mL	H_2O	SPEC-CR6M
Chromium +6	1,000 µg/mL	125 mL	H_2O	SPEC-CR6
Selenium +4	1,000 µg/mL	30 mL	2% HNO_3	SPEC-SE4M
Selenium +4	1,000 µg/mL	125 mL	2% HNO_3	SPEC-SE4
Selenium +6	1,000 µg/mL	30 mL	H_2O	SPEC-SE6M
Selenium +6	1,000 µg/mL	125 mL	H_2O	SPEC-SE6

spex certiprep

ACCREDITED Reference Materials Producer Cert. #2495.01

ACCREDITED Chemical Testing Cert. #2495.02

Catalog Number: SPEC-AS3 **Lot No.** CL5-199MKBY
Description: Arsenic +3 Speciation Standard
Matrix: 2% HCl

The Certified Reference Material, CRM, is intended primarily for use as a quality control standard for inorganic spectroscopic instrumentation such as LC-ICP-MS. It can be employed in validating analytical methods for the determination of relevant species.

Certified Value [As (total)]: 20.2 ± 0.4 µg/mL

Certified Value is Traceable to: 3103a*

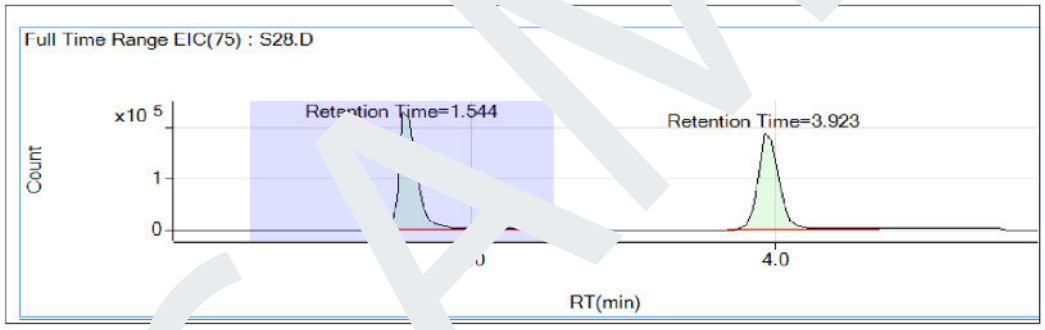
* - Indicates NIST SRM † - Indicates Spex CertiPrep CRM (when NIST SRM is not available)

The CRM is prepared gravimetrically using high purity Arsenic (III) Oxide (As2O3), Lot #08831RAS and Arsenic (V) Oxide (As2Os), Lot #10111D. The certified value for overall Arsenic is obtained by ICP measurement. The value is As (III) and As (V) in this speciation standard is obtained by LC-ICP-MS.

Refer to side 2 for details of measurement quantities.

Uncertified Properties: Density: 0.998 g/mL @ 20 °C

Instrumental Analysis by LC-ICP-MS Spectrometer: [AS (III)]: 10.3 ± 0.5 µg/mL
[As (V)]: 10.4 ± 0.5 µg/mL



Retention Time
[AS (III)]: 1.804 min
[As (V)]: 3.439 min

Note: The above chromatogram was obtained by analyzing a diluted standard at a concentration of 25 µg/L of each species. An injection volume of 25 µL was used. The final result of each species was determined against a calibration curve of each individual species using peak area.

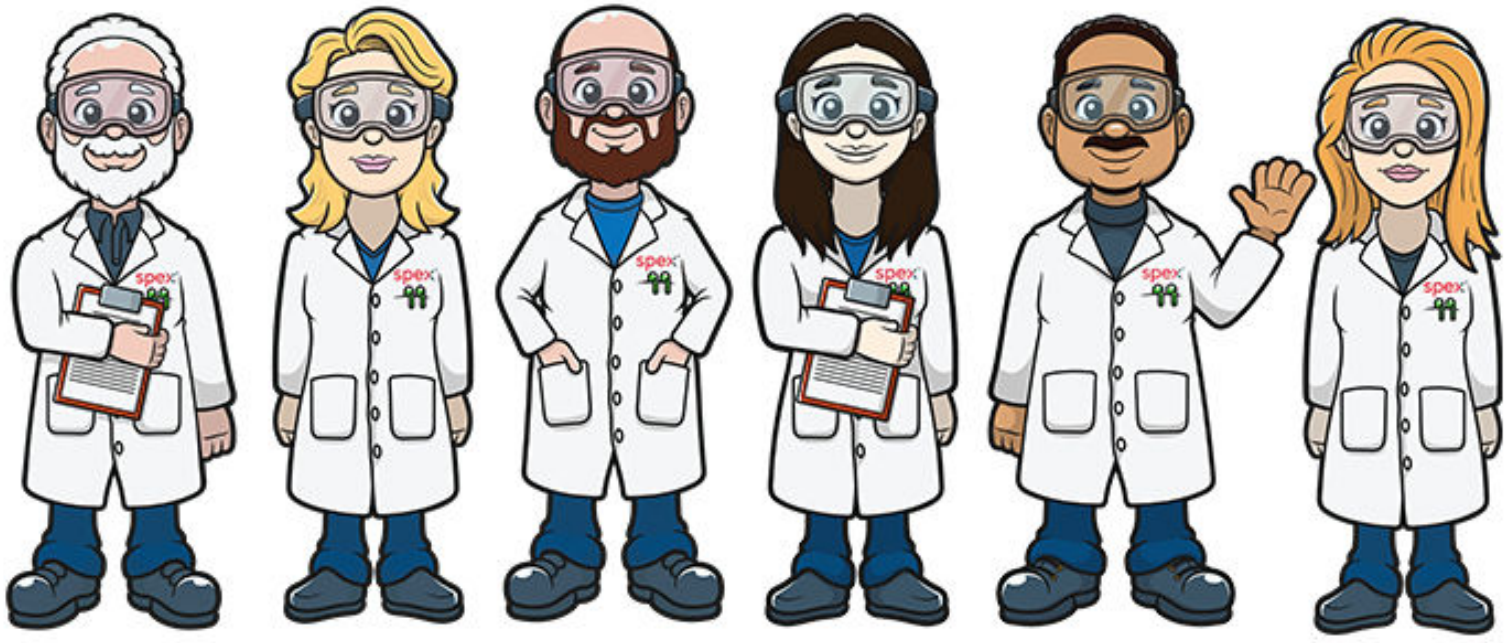
From Your Bench to Our Bench

Bench Talk!

Have a question? Ask a Chemist!

Do you have a technical CRM question for our experienced chemists? We have a dedicated technical support team to answer your CRM and lab questions.

Simply e-mail us at **AskAChemist@antylia.com** and we will be happy to help you. To view previously asked questions, visit **spex.com/knowledge-base/ask-a-chemist**.



spex® certiprep

section 3

- Made with acid and ASTM Type I Water
- Inorganic compounds and metals at 99.99& to 99.9999% purity (where commercially available)
- Directly traceable to NIST (where applicable)
- Certified by DQS to ISO 9001:2015
- Accredited by A2LA to ISO/IEC 17025:2017 and ISO 17034:2016

Claritas PPT® Grade CRMs are designed for ICP and ICP-MS analysis. They are available in single and multi-element solutions. The standards are at 1 µg/mL, 10 µg/mL, 100 µg/mL, or 1,000 µg/mL and packaged in 30 mL and 125 mL bottles to minimize contamination. They are made using ultra high purity acids, the highest grade starting materials and high purity water in order to minimize contaminants. Custom standards can be manufactured upon request.

Designed For Use With	ICP | ICP-MS
Analytical Range For Use	ppb, ppt
Single-Element Standards	√
1 µg/mL	√
10 µg/mL	√
100 µg/mL	√
1,000 µg/mL	√
Multi-Element Standards	√
Custom Standards	√
Certifications	
ISO 9001:2015	√
ISO/IEC 17025:2017	√
ISO 17034:2016	√
Quality	
Traceable to NIST SRM (where applicable)	√
Acid Grade	Ultra High Purity Grade
# Trace Impurities Measured on Certificate of Analysis	68
Trace Impurities Measured to	µg/L
Volume	
30 mL	√
125 mL	√

Al
Aluminum

Atomic Number	13
Atomic Mass	26.982
Density	2.7 g/cm^3
Melting Point	660 °C
Boiling Point	2467 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLAL2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLAL2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLAL2-2Y

Sb
Antimony

Atomic Number	51
Atomic Mass	121.760
Density	6.697 g/cm^3
Melting Point	630 °C
Boiling Point	1587 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.6% Tartaric Acid/tr. HNO_3	CLSB7-2M
1,000 µg/mL	125 mL	H_2O/0.6% Tartaric Acid/tr. HNO_3	CLSB7-2Y

As
Arsenic

Atomic Number	33
Atomic Mass	74.922
Density	5.727 g/cm^3
Melting Point	817 °C
Boiling Point	614 °C*

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLAS2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLAS2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLAS2-2Y

** Sublimation Point.*

Ba
Barium

Atomic Number	56
Atomic Mass	137.327
Density	3.51 g/cm^3
Melting Point	727 °C
Boiling Point	1897 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLBA2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLBA2-2Y

Be
Beryllium

Atomic Number	4
Atomic Mass	9.012
Density	1.848 g/cm^3
Melting Point	1287 °C
Boiling Point	2471 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLBE2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLBE2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLBE2-2Y

Bi
Bismuth

Atomic Number	83
Atomic Mass	208.980
Density	9.78 g/cm^3
Melting Point	271 °C
Boiling Point	1564 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLBI2-1BY
10 µg/mL	30 mL	2% HNO_3	CLBI2-1AM
10 µg/mL	125 mL	2% HNO_3	CLBI2-1AY

B Boron

Atomic Number	5
Atomic Mass	10.811
Density	2.46 g/cm^3
Melting Point	2075 °C
Boiling Point	4000 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	H_2O	CLB9-1BY

Cd Cadmium

Atomic Number	48
Atomic Mass	112.411
Density	8.65 g/cm^3
Melting Point	321 °C
Boiling Point	767 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLCD2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLCD2-2Y

Ca Calcium

Atomic Number	20
Atomic Mass	40.078
Density	1.55 g/cm^3
Melting Point	842 °C
Boiling Point	1484 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLCA2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLCA2-2Y

Cr Chromium

Atomic Number	24
Atomic Mass	51.996
Density	7.14 g/cm^3
Melting Point	1907 °C
Boiling Point	2671 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLCR2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLCR2-2Y

Co Cobalt

Atomic Number	27
Atomic Mass	58.933
Density	8.9 g/cm^3
Melting Point	1495 °C
Boiling Point	2927 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLCO2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLCO2-2Y

Cu Copper

Atomic Number	29
Atomic Mass	63.546
Density	8.92 g/cm^3
Melting Point	1084 °C
Boiling Point	2562 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLCU2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLCU2-2Y

Gd Gadolinium

Atomic Number	64
Atomic Mass	157.25
Density	7.9 g/cm^3
Melting Point	1312 °C
Boiling Point	3266 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLGD2-1BY

Ga Gallium

Atomic Number	31
Atomic Mass	69.723
Density	5.904 g/cm^3
Melting Point	30 °C
Boiling Point	2204 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLGA2-1BY

Ge
Germanium

Atomic Number	32
Atomic Mass	72.63
Density	5.323 g/cm^3
Melting Point	938 °C
Boiling Point	2833 °C

Concentration	Volume	Matrix	Part #
10 µg/mL	30 mL	H_2O/tr. F^-	CLGE9-1AM
10 µg/mL	125 mL	H_2O/tr. F^-	CLGE9-1AY

Au
Gold

Atomic Number	79
Atomic Mass	196.967
Density	19.3 g/cm^3
Melting Point	1064 °C
Boiling Point	2970 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	1% HNO_3/3% HCl	CLAU6-1BY
100 µg/mL	30 mL	2% HCl	CLAU1-1M
100 µg/mL	125 mL	2% HCl	CLAU1-1Y

In
Indium

Atomic Number	49
Atomic Mass	114.818
Density	7.31 g/cm^3
Melting Point	157 °C
Boiling Point	2072 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLIN2-1BY
10 µg/mL	30 mL	2% HNO_3	CLIN2-1AM
10 µg/mL	125 mL	2% HNO_3	CLIN2-1AY

Ir
Iridium

Atomic Number	77
Atomic Mass	192.217
Density	22.56 g/cm^3
Melting Point	2446 °C
Boiling Point	4428 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HCl	CLIR1-1BY

Fe
Iron

Atomic Number	26
Atomic Mass	55.845
Density	7.874 g/cm^3
Melting Point	1538 °C
Boiling Point	2861 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLFE2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLFE2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLFE2-2Y

Pb
Lead

Atomic Number	82
Atomic Mass	207.2
Density	11.34 g/cm^3
Melting Point	327 °C
Boiling Point	1749 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLPB2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLPB2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLPB2-2Y

Li
Lithium

Atomic Number	3
Atomic Mass	6.941
Density	0.535 g/cm^3
Melting Point	181 °C
Boiling Point	1342 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLLI2-1BY

Lu
Lutetium

Atomic Number	71
Atomic Mass	174.967
Density	9.841 g/cm^3
Melting Point	1663 °C
Boiling Point	3402 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLLU2-1BY

Mg
Magnesium

Atomic Number	12
Atomic Mass	24.305
Density	1.738 g/cm^3
Melting Point	650 °C
Boiling Point	1090 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLMG2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLMG2-2Y

Mn
Manganese

Atomic Number	25
Atomic Mass	54.938
Density	7.47 g/cm^3
Melting Point	1247 °C
Boiling Point	2061 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLMN2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLMN2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLMN2-2Y

Hg
Mercury

Atomic Number	80
Atomic Mass	200.59
Density	13.534 g/cm^3
Melting Point	-39 °C
Boiling Point	356 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	0.7% HNO_3/0.4% HCl	CLHG6-1BY
10 µg/mL	30 mL	5% HNO_3	CLHG2-1AM
10 µg/mL	125 mL	5% HNO_3	CLHG2-1AY
1,000 µg/mL	30 mL	10% HNO_3	CLHG4-2M
1,000 µg/mL	125 mL	10% HNO_3	CLHG4-2Y

Mo
Molybdenum

Atomic Number	42
Atomic Mass	95.96
Density	10.28 g/cm^3
Melting Point	2623 °C
Boiling Point	4639 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	H_2O	CLMO9-1BY
1,000 µg/mL	30 mL	H_2O	CLMO9-2M
1,000 µg/mL	125 mL	H_2O	CLMO9-2Y

Nd
Neodymium

Atomic Number	60
Atomic Mass	144.242
Density	7.01 g/cm^3
Melting Point	1024 °C
Boiling Point	3074 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLND2-1BY

Ni
Nickel

Atomic Number	28
Atomic Mass	58.693
Density	8.908 g/cm^3
Melting Point	1455 °C
Boiling Point	2913 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLNI2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLNI2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLNI2-2Y

P
Phosphorus

Atomic Number	15
Atomic Mass	30.974
Density	1.823 g/cm^3
Melting Point	44 °C
Boiling Point	277 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	H_2O	CLP9-1BY

Pt
Platinum

Atomic Number	78
Atomic Mass	195.064
Density	21.09 g/cm^3
Melting Point	1768 °C
Boiling Point	3825 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HCl	CLPT1-1BY

K
Potassium

Atomic Number	19
Atomic Mass	39.098
Density	0.856 g/cm^3
Melting Point	63 °C
Boiling Point	759 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLK2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLK2-2Y

Rh
Rhodium

Atomic Number	45
Atomic Mass	102.905
Density	12.45 g/cm^3
Melting Point	1964 °C
Boiling Point	3695 °C

Concentration	Volume	Matrix	Part #
10 µg/mL	30 mL	2% HCl	CLRH1-1AM
10 µg/mL	125 mL	2% HCl	CLRH1-1AY

Sc
Scandium

Atomic Number	21
Atomic Mass	44.956
Density	2.985 g/cm^3
Melting Point	1541 °C
Boiling Point	2836 °C

Concentration	Volume	Matrix	Part #
10 µg/mL	30 mL	2% HNO_3	CLSC2-1AM
10 µg/mL	125 mL	2% HNO_3	CLSC2-1AY

Se
Selenium

Atomic Number	34
Atomic Mass	78.96
Density	4.819 g/cm^3
Melting Point	221 °C
Boiling Point	685 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLSE2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLSE2-2Y

Si
Silicon

Atomic Number	14
Atomic Mass	28.085
Density	2.33 g/cm^3
Melting Point	1414 °C
Boiling Point	3265 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	H_2O/tr. F^-	CLSI9-1BY

Ag
Silver

Atomic Number	47
Atomic Mass	107.868
Density	10.49 g/cm^3
Melting Point	962 °C
Boiling Point	2162 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLAG2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLAG2-2Y

Na
Sodium

Atomic Number	11
Atomic Mass	22.989
Density	0.968 g/cm^3
Melting Point	98 °C
Boiling Point	883 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLNA2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLNA2-2Y

Sr
Strontium

Atomic Number	38
Atomic Mass	87.62
Density	2.63 g/cm^3
Melting Point	777 °C
Boiling Point	1382 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLSR2-1BY

Tb
Terbium

Atomic Number	65
Atomic Mass	158.925
Density	8.219 g/cm^3
Melting Point	1356 °C
Boiling Point	3230 °C

Concentration	Volume	Matrix	Part #
10 µg/mL	30 mL	2% HNO_3	CLTB2-1AM
10 µg/mL	125 mL	2% HNO_3	CLTB2-1AY

Th
Thorium (Depleted)

Atomic Number	90
Atomic Mass	232.038
Density	11.724 g/cm^3
Melting Point	1842 °C
Boiling Point	4788 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLTH2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLTH2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLTH2-2Y

Ti
Titanium

Atomic Number	22
Atomic Mass	47.857
Density	4.507 g/cm^3
Melting Point	1668 °C
Boiling Point	3287 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	H_2O/0.24% F^-	CLTI9-2M
1,000 µg/mL	125 mL	H_2O/0.24% F^-	CLTI9-2Y

U
Uranium (Depleted)

Atomic Number	92
Atomic Mass	238.027
Density	19.05 g/cm^3
Melting Point	1132 °C
Boiling Point	4131 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLU2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLU2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLU2-2Y

Tl
Thallium

Atomic Number	81
Atomic Mass	204.383
Density	11.85 g/cm^3
Melting Point	304 °C
Boiling Point	1473 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLTL2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLTL2-2Y

Sn
Tin

Atomic Number	50
Atomic Mass	118.71
Density	7.31 g/cm^3
Melting Point	232 °C
Boiling Point	2602 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	1% HNO_3/1% HF	CLSN2-2M
1,000 µg/mL	125 mL	1% HNO_3/1% HF	CLSN2-2Y

W
Tungsten

Atomic Number	74
Atomic Mass	183.84
Density	19.25 g/cm^3
Melting Point	3422 °C
Boiling Point	5555 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3/tr. HF	CLW2-1BY

V
Vanadium

Atomic Number	23
Atomic Mass	50.941
Density	6.11 g/cm^3
Melting Point	1910 °C
Boiling Point	3407 °C

Concentration	Volume	Matrix	Part #
1,000 µg/mL	30 mL	2% HNO_3	CLV2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLV2-2Y

Y
Yttrium

Atomic Number	39
Atomic Mass	88.906
Density	4.472 g/cm^3
Melting Point	1526 °C
Boiling Point	3336 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLY2-1BY
10 µg/mL	30 mL	2% HNO_3	CLY2-1AM
10 µg/mL	125 mL	2% HNO_3	CLY2-1AY

Zn
Zinc

Atomic Number	30
Atomic Mass	65.38
Density	7.14 g/cm^3
Melting Point	419 °C
Boiling Point	907 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLZN2-1BY
1,000 µg/mL	30 mL	2% HNO_3	CLZN2-2M
1,000 µg/mL	125 mL	2% HNO_3	CLZN2-2Y

Zr
Zirconium

Atomic Number	40
Atomic Mass	91.224
Density	6.511 g/cm^3
Melting Point	1855 °C
Boiling Point	4409 °C

Concentration	Volume	Matrix	Part #
1 µg/mL	125 mL	2% HNO_3	CLZR2-1BY

Description	Volume	Matrix	Part #
Hydrochloric Acid Blank	125 mL	2% HCl	CLBLK-HCL
Nitric Acid Blank	30 mL	2% HNO_3	CLBLK-HNO3M
Nitric Acid Blank	125 mL	2% HNO_3	CLBLK-HNO3
Nitric Acid Blank	250 mL	2% HNO_3	CLBK-HNO3-250
DI Water Blank	125 mL	H_2O	CLBLK-H2O
DI Water Blank	250 mL	H_2O	CLBK-H2O-250

Elements	Concentration	Volume	Matrix	Part #
Boron 10	10 µg/mL	125 mL	H_2O	ISOT-B10
Boron 11	10 µg/mL	125 mL	H_2O	ISOT-B11
Copper 65	10 µg/mL	125 mL	2% HNO_3	ISOT-CU65
Lead 206	10 µg/mL	125 mL	2% HNO_3	ISOT-PB206
Lead 207	10 µg/mL	125 mL	2% HNO_3	ISOT-PB207
Lithium 6	100 µg/mL	30 mL	2% HNO_3	ISOT-LI6M
Lithium 6	100 µg/mL	125 mL	2% HNO_3	ISOT-LI6
Strontium 86	10 µg/mL	125 mL	2% HNO_3	ISOT-SR86
Zinc 68	10 µg/mL	125 mL	2% HNO_3	ISOT-ZN68

"Famed chemist Glenn Seaborg was the only person who could write his address in chemical elements. He would write Sg, Lr, Bk, Cf, Am. That's Seaborgium (Sg), named after Seaborg himself; Lawrencium (Lr), named after the Lawrence Berkeley National Laboratory; Berkelium (Bk), named after the city of Berkeley, the home of UC Berkeley; Californium (Cf), named after the state of California; Americium (Am), named after America."

- Made with acid and ASTM Type I Water
- Inorganic compounds and metals at 99.99& to 99.9999% purity (where commercially available)
- Directly traceable to NIST (where applicable)
- Certified by DQS to ISO 9001:2015
- Accredited by A2LA to ISO/IEC 17025:2017 and ISO 17034:2016

Claritas PPT® Grade CRMs are designed for ICP and ICP-MS analysis. They are available in single and multi-element solutions. The standards are at 1 µg/mL, 10 µg/mL, 100 µg/mL, or 1,000 µg/mL and packaged in 30 mL and 125 mL bottles to minimize contamination. They are made using ultra high purity acids, the highest grade starting materials and high purity water in order to minimize contaminants. Custom standards can be manufactured upon request.

Assurance® Grade CRMs are designed for AA and ICP and are available in single and multi-element formulations. 70 elements are available as single-element standards and are available at 1,000 µg/mL and/or 10,000 µg/mL. They are packaged in 30 mL, 125 mL, 250 mL, and 500 mL bottles to minimize contamination. Custom standards can be manufactured upon request.

	Claritas PPT® Grade CRMs	Assurance® Grade CRMs
Designed For Use With	ICP | ICP-MS	AA | ICP
Analytical Range For Use	ppb, ppt	ppm, ppb
Single-Element Standards	√	√
1 µg/mL	√	
10 µg/mL	√	√
100 µg/mL	√	
1,000 µg/mL	√	√
10,000 µg/mL		√
Multi-Element Standards	√	
Custom Standards	√	√
ISO 9001:2015	√	√
ISO/IEC 17025:2017	√	√
ISO 17034:2016	√	√
Traceable to NIST SRM (where applicable)	√	√
Acid Grade	Ultra High Purity Grade	High Purity Grade
# Trace Impurities Measured on Certificate of Analysis	68	68
Trace Impurities Measured to	µg/L	µg/mL
30 mL	√	√
125 mL	√	√
250 mL		√
500 mL		√

SPEXperience™

Creating An Awesome Customer Experience

It's not only what we do, it's how we do it. We have been manufacturing Inorganic and Organic Certified Reference Materials and Calibration Standards for the Analytical Spectroscopy and Chromatography communities since 1954. Our passion for science and dedication to the analytical community drives us to go above and beyond for you. We want to provide you with the customer experience you deserve and can rely on. We do this by making sure you are our priority in everything we do.

Experience

67+

Over 67 years experience manufacturing Certified Reference Materials (CRMs) and sample preparation equipment

Scope

Most comprehensive scope of accreditations and certifications in the industry

Turnaround

Stock products ship within 24 -48 hours

Tech Support

Dedicated technical support to answer your chemical or sample preparation questions

Selection

Selection of over 10,000 inventoried parts

Customs

Custom standards and sample preparation equipment manufactured upon request based on your individual needs

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section 4

Multi-Element Standards for AA & ICP

The section that follows contains multi-element standards with a combination of elements, concentrations and matrices, designed by Spex CertiPrep for convenience of use and stability.

Standards may be diluted in the same matrix as specified; however, caution must be exercised in the choice of the source for your diluents. Diluting the matrix may cause some standards to precipitate. Also, an impure or unknown diluent turns your standard into an unknown. We recommend using only Spex CertiPrep Matrix Blanks when diluting your standards.

- Mixed Multi-Element Calibration Standards
- Calibration and Matrix Blanks
- Instrument Check (Lab Performance) Standards
- Quality Control Standards
- Lab Fortifying Stock (LFS) Solution
- Laboratory Performance Check (LPC) Standards
- Interference Check Standards
- Environmental EPA Set
- Toxicity Characteristic Leachate Procedure (TCLP) Standard
- Drinking Water Pollutant Standards
- Groundwater and Wastewater Pollution Control Check Standards

CALIBRATE WITH CONFIDENCE®

Spex CertiPrep continues to supply the most comprehensive certificate of analysis in the industry. For example, our SPEXertificate shows actual reported values for ICP of the final solution - not reported values of the starting materials or by a calculation. It also reports the trace impurities of the final solution - not of the starting materials.

In addition, each elemental impurity is listed with actual value - not limited to the element above detection limits. We also scan 68 elements with found values for all of our products which are traceable to NIST. Many other companies have followed, but not one gives you the information you get from us!

Spex CertiPrep is accredited by A2LA for Inorganic and Organic Certified Reference Materials. In addition, to being registered as an ISO 9001:2015 facility, Spex CertiPrep is accredited by A2LA as complying with the requirements of ISO/IEC 17025:2017 and ISO 17034:2016. Our scope of accreditation is the most comprehensive in the industry.

The following Calibration Standards are provided for routine instrument calibration. The concentrations and matrices have been selected for convenience of use and stability.

For use in US EPA Method 200.7 (Revision 4.4) and SW-846, Method 6010 (Third Edition).

Elements	Concentration	Matrix
Ag	5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
Ba	10 µg/mL	
B, Cd, Cu, Mn	20 µg/mL	
Sb, Se	50 µg/mL	
As, Ca	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD1A-100	500 mL	MIXSTD1A-500

Elements	Concentration	Matrix
Ag	5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
B, Ba	10 µg/mL	
Cd, Cu, Mn	20 µg/mL	
Sb, Se	50 µg/mL	
As, Ca	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD1C-100	500 mL	MIXSTD1C-500

Elements	Concentration	Matrix
Sr	10 µg/mL	5% HNO_3
Li	50 µg/mL	
Mo, Na	100 µg/mL	
K	200 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD2A-100	500 mL	MIXSTD2A-500

Elements	Concentration	Matrix
Ce, Co, V	20 µg/mL	5% HNO_3
P	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD3A-100	500 mL	MIXSTD3A-500

Elements	Concentration	Matrix
Sn	40 µg/mL	5% HNO_3/tr. HF
Cr, Zn	50 µg/mL	
Al, Hg*, SiO_2, Ti	100 µg/mL	

Volume	Part #
125 mL	MIXSTD4A-100

Volume	Part #
500 mL	MIXSTD4A-500

** Mercury is supplied as a separate solution (PLGH2-1AY/X) due to incompatibility with other elements.*

Elements	Concentration	Matrix
Sn	40 µg/mL	5% HNO_3/tr. HF
Cr, Zn	50 µg/mL	
Al, SiO_2, Ti	100 µg/mL	

Volume	Part #
125 mL	MXSTD4A-100N

Volume	Part #
500 mL	MXSTD4A-500N

Elements	Concentration	Matrix
Be	10 µg/mL	5% HNO_3
Ni	20 µg/mL	
Tl	50 µg/mL	
Fe, Mg, Pb	100 µg/mL	

Volume	Part #
125 mL	MIXSTD5A-100

Volume	Part #
500 mL	MIXSTD5A-500

Set Contains	Part #
MIXSTD1A-100	MIXSTD-SETA
MIXSTD2A-100	
MIXSTD3A-100	
MIXSTD4A-100	
MIXSTD5A-100	
PLHG2-1Y	

** Mercury is supplied as a separate solution (PLGH2-1X/Y) due to incompatibility with other elements.*

Set Contains	Part #
MIXSTD1A-100	MXSTD-SETAN
MIXSTD2A-100	
MIXSTD3A-100	
MXSTD4A-100N	
MIXSTD5A-100	

Set Contains		Part #
MIXSTD1-100	MIXSTD4-100	MIXSTD-SET
MIXSTD2-100	MIXSTD5-100	
MIXSTD3-100		

Elements	Concentration	Matrix
Be	50 µg/mL	2% HNO_3
Mn	100 µg/mL	
Cd, Zn	150 µg/mL	
Se	200 µg/mL	
Pb	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD1-100	500 mL	MIXSTD1-500

Elements	Concentration	Matrix
Ba, Co, Cu, V	100 µg/mL	5% HNO_3
Fe	10,000 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD2-100	500 mL	MIXSTD2-500

Elements	Concentration	Matrix
Mo, Si	100 µg/mL	2% HNO_3/tr. HF
As	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD3-100	500 mL	MIXSTD3-500

Elements	Concentration	Matrix
Cr, Ni	20 µg/mL	5% HNO_3
Al, Na	200 µg/mL	
K	400 µg/mL	
Ca	1,000 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD4-100	500 mL	MIXSTD4-500

Elements	Concentration	Matrix
Ag	50 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
B	100 µg/mL	
Sb, Tl	200 µg/mL	
Mg	1,000 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MIXSTD5-100	500 mL	MIXSTD5-500

Used to calibrate and verify wavelength accuracy and stability in sequential and simultaneous ICP units. Each CAL-MIX is designed to give the user wavelength ranges from 160 nm to 790 nm. Every ICP manufacturer has a specific group of elements at varying concentrations to determine instrument accuracy and reliability. Some have special calibration programs incorporated into their software; others give you information in their manuals. These standards are also useful as training tools for technicians or for methods development. Check your ICP manual or service guide for more information.

Elements	Concentration	Matrix
As, La, Li, Mn, Mo, Na, Ni, Sc	20 µg/mL	5% HCl
K, P, S	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	CALMIX3-100	500 mL	CALMIX3-500

Elements	Concentration	Matrix
Ba	1 µg/mL	2% HNO_3
Al, As, Cu, Mn, Na, Ni, P, Pb, Sc, Zn	10 µg/mL	
K	50 µg/mL	

Volume	Part #	Volume	Part #
125 mL	CALMIX4-100	500 mL	CALMIX4-500

Elements	Concentration	Matrix
Al, As, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Zn	100 µg/mL	2% HNO_3
Y	600 µg/mL	

Volume	Part #	Volume	Part #
125 mL	CALMIX7-100	500 mL	CALMIX7-500

Elements	Concentration	Matrix
Al, As, Co, Cr, Cu, K, Na, P, Pb	50 µg/mL	2% HNO_3

Volume	Part #	Volume	Part #
125 mL	CALMIX8-100	500 mL	CALMIX8-500

Elements	Concentration	Matrix
Al, Ba, Cd, Cu, Mn, Zn	50 µg/mL	2% HNO_3
K	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	CALMIX10-100	500 mL	CALMIX10-500

Quality Control Standards are used to check the standard curve, the procedure for inter-element correction and other spectral interferences. These standards are carried through the entire analytical operation of the method. If the determined concentration is not within ± 5% of 1 µg/mL, the laboratory performance is unacceptable. The source of the problem should be identified and corrected before continuing the analysis.

Elements	Concentration	Matrix
Si	50 µg/mL	5% HNO_3/tr. F^-
Ag, Al, B, Ba, Na	100 µg/mL	
K	1,000 µg/mL	

Volume	Part #	Volume	Part #
125 mL	QC-7	500 mL	QC-7-500

Elements	Concentration	Matrix
Ag	50 µg/mL	5% HNO_3/tr. HF
Al, B, Ba, Na	100 µg/mL	
Si	500 µg/mL	
K	1,000 µg/mL	

Volume	Part #	Volume	Part #
125 mL	QC-7A	500 mL	QC-7A-500

Elements	Concentration	Matrix
As, Be, Ca, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sr, Ti, Tl, V, Zn	100 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF

Volume	Part #	Volume	Part #	Volume	Part #
125 mL	QC-21	250 mL	QC-21-250	500 mL	QC-21-500

Elements	Concentration	Matrix
Ag	50 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
As, Be, Ca, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sr, Ti, Tl, V, Zn	100 µg/mL	

Volume	Part #	Volume	Part #	Volume	Part #
125 mL	QC-22	250 mL	QC-22-250	500 mL	QC-22-500

Aqua regia, or "royal water", is a mixture of 1 part nitric acid and 3 parts hydrochloric acid used to digest gold and platinum. An aqua regia solution can be prepared by using Spex CertiPrep nitric acid and hydrochloric acid blanks.

Elements	Concentration	Matrix
Ag, Al, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, In, K, Li, Mg, Mn, Na, Ni, Pb, Sr, Tl, Zn	1,000 µg/mL	10% HNO_3

Volume	Part #
125 mL	QC-23

Elements	Concentration	Matrix
Ag, Al, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, In, K, Li, Mg, Mn, Na, Ni, Pb, Tl, Zn	10 µg/mL	10% HNO_3

Volume	Part #
125 mL	QC-24

Set Contains	Part #
QC-21	QC-SETA
QC-7A	

Set Contains	Part #
QC-21	QC-SETB
QC-7	

Used for spiking the laboratory fortified blank and the laboratory fortified sample matrix. Two (2 mL) of the LFS solution must be added to a 100 mL aliquot of the laboratory fortified blank. This blank must be carried through the entire sample preparation procedure and analysis scheme. *Note: LFS Solution 1 does not contain Ca, K, Mg, or Na because their concentration will vary from one environmental sample to the other. Please view pages 10-21 for all single-element CRMs.*

Elements	Concentration	Matrix
Ag	2.5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
Be	5 µg/mL	
Cd, Co, Hg*, Mo, Sn, V	10 µg/mL	
Al, As, B, Ba, Cr, Cu, Fe, Li, Mn, Ni, Pb, Sb, Se, SiO_2, Sr, Tl, Zn	25 µg/mL	
P	50 µg/mL	

Volume	Part #
125 mL	LFS-1-100

Volume	Part #
500 mL	LFS-1-500

** Mercury is supplied as a separate solution (PLHG2-1AY/AX (10 µg/mL)) due to incompatibility with other elements.*

Elements	Concentration	Matrix
Ag	2.5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
Be	5 µg/mL	
Cd, Co, Mo, Sn, V	10 µg/mL	
Al, As, B, Ba, Cr, Cu, Fe, Li, Mn, Ni, Pb, Sb, Se, SiO_2, Sr, Tl, Zn	25 µg/mL	
P	50 µg/mL	

Volume	Part #
125 mL	LFS-1-100N

Volume	Part #
500 mL	LFS-1-500N

The Laboratory Performance Check (LPC) Standard is a solution of method analytes used to evaluate the performance of the instrument. The LPC standard is used immediately following calibration, after every tenth sample, and at the end of the sample run. The analyzed value of each analyte in the LPC solution should be within 95% to 105% of its expected value. If the analyte value is outside of the interval, reanalyze the LPC. If the analyte is again outside of the ± 5% limit, the instrument should be recalibrated and all samples following the last acceptable LPC solution should be reanalyzed.

Elements	Concentration	Matrix
Ag	5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn	20 µg/mL	
Hg*, K, P, SiO_2	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	LPC-1-100	125 mL	LPC-1-500

** Mercury is supplied as a separate solution (PLHG2-1X/Y (10 µg/mL)) due to incompatibility with other elements.*

Elements	Concentration	Matrix
Ag	5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn	20 µg/mL	
K, P, SiO_2	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	LPC-1-100N	125 mL	LPC-1-500N

For use in US EPA Method 6010 and 200.7 (Revision 4.4).

Set Contains	Part #
MIXSTD1-100	EPA-SET
MIXSTD2-100	
MIXSTD3-100	
MIXSTD4-100	
MIXSTD5-100	
INTER18-100	
INTER5-100	
PLHG2-1Y	
PLSB7-2Y	
PLBLK-HCL**	
PLBLK-HNO3**	

Set Contains	Part #
MIXSTD1-100	EPA-SETN
MIXSTD2-100	
MIXSTD3-100	
MIXSTD4-100	
MIXSTD5-100	
INTER18-100N	
INTER5-100	
PLSB7-2Y	
PLBLK-HCL**	
PLBLK-HNO3**	

** Mercury is supplied as a separate solution (PLHG2-1X/1Y) due to incompatibility with other elements.*

*** PLBLK-HCL and PLBLK-HNO3 are at 500 mL.*

The Interference Check Standards are used to set or confirm that the correct background correction intervals have been set for sequential ICP spectrometers and that the proper inter-element correction factors are set for simultaneous ICP spectrometers.

For use in US EPA Method 200.7 (Revision 4.4) and SW-846, Method 6010 (Third Edition).

Elements	Concentration	Matrix
Sb	1,000 µg/mL	H_2O/tr. HNO_3/0.6% Tartaric Acid

Volume	Part #
125 mL	PLSB7-2Y

Volume	Part #
500 mL	PLSB7-2X

Elements	Concentration	Matrix
Na	1,000 µg/mL	5% HNO_3
Al	1,200 µg/mL	
Mg	3,000 µg/mL	
Fe	5,000 µg/mL	
Ca	6,000 µg/mL	

Volume	Part #
125 mL	INTER5-100

Volume	Part #
500 mL	INTER5-500

Elements	Concentration	Matrix
Be, Hg*	100 µg/mL	5% HNO_3
Mn	200 µg/mL	
Ag, Ba, Cd, Co, Cr, Cu, Ni, V, Zn	300 µg/mL	
Se	500 µg/mL	
As, Pb, Tl	1,000 µg/mL	
K	20,000 µg/mL	

Volume	Part #
125 mL	INTER18-100

Volume	Part #
500 mL	INTER18-500

** Mercury is supplied as a separate solution (PLHG2-1X/1Y) due to incompatibility with other elements.*

Set Contains	Part #
PLSB7-2Y	INTER-SET
PLHG2-1Y	
INTER5-100	
INTER18-100	

Set Contains	Part #
PLSB7-2Y	INTER-SETN
INTER5-100	
INTER18-100N	

Elements	Concentration	Matrix
Be	100 µg/mL	5% HNO_3
Mn	200 µg/mL	
Ag, Ba, Cd, Co, Cr, Cu, Ni, V, Zn	300 µg/mL	
Se	500 µg/mL	
As, Pb, Tl	1,000 µg/mL	
K	20,000 µg/mL	

Volume	Part #	Volume	Part #
125 mL	INTER18-100N	500 mL	INTER18-500N

Designed to determine the mobility of the Inorganic contaminants present in liquid, solid and multi-phase wastes. To simplify, TCLP is designed to determine the hazardous contaminants that are actually entering into the environment. In addition to the Spex CertiPrep TCLP Standards, designed with all of the elements in one solution, the Toxicity Characteristic rule separates the elements according to specific instrumentation: ICP, GFAA, and Cold Vapor AA.

For use in accordance with the Toxicity Characteristic Rule Regulatory Levels issued in the Federal Register 55, 11846 March 1990; Method 1311.

Elements	Concentration	Matrix
Cd, Se	5 µg/mL	2% HNO_3
Ag, As, Cr, Pb	25 µg/mL	
Hg*	100 µg/mL	
Ba	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	TCLP-100	500 mL	TCLP-500

** Mercury is supplied as a separate solution (PLHG2-1X/Y) due to incompatibility with other elements.*

Elements	Concentration	Matrix
Cd, Se	5 µg/mL	2% HNO_3
Ag, As, Cr, Pb	25 µg/mL	
Ba	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	TCLP-100N	500 mL	TCLP-500N

These standards are for use with procedures for compliance monitoring of drinking water and for analysis of ground and surface water where determination of the drinking water contamination levels are required.

Refer to US National Primary Drinking Water Regulations 40 CFR, Part 141.

Elements	Concentration	Matrix
Cd, Se	5 µg/mL	2% HNO_3
Ag, As, Cr, Hg*, Pb	10 µg/mL	
Ba	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	EP-8	500 mL	EP-8-500

** Mercury is supplied as a separate solution (PLHG2-1AX/Y) due to incompatibility with other elements.*

Elements	Concentration	Matrix
Cd, Se	5 µg/mL	2% HNO_3
Ag, As, Cr, Pb	10 µg/mL	
Ba	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	EP-8N	500 mL	EP-8-500N

Elements	Concentration	Matrix
Mn	5 µg/mL	2% HNO_3
Fe	30 µg/mL	
Cu	100 µg/mL	
Zn	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	EP-4	500 mL	EP-4-500

Set Contains	Part #
EP-8	DW-SET
EP-4	
PLHG2-1AY	

Set Contains	Part #
EP-8N	DW-SETN
EP-4	

** Mercury is supplied as a separate solution (PLHG2-1AX/Y) due to incompatibility with other elements.*

May be used either as standards or as a means to check the individual analysts accuracy and precision.

Refer to US EPA Methods Manual 600/4-79-020 "Methods for Chemical Analysis of Water and Wastes" Trace Metals 21I, 21II and 21III Methods.

Elements	Concentration	Matrix
Hg*	10 µg/mL	5% HNO_3
Cd, Se	25 µg/mL	
As, Be, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn	100 µg/mL	
V	250 µg/mL	
Al	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	WP-15	500 mL	WP-15-500

** Mercury is supplied as a separate solution (PLHG2-1AY/AX) due to incompatibility with other elements.*

Elements	Concentration	Matrix
Cd, Se	25 µg/mL	5% HNO_3
As, Be, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn	100 µg/mL	
V	250 µg/mL	
Al	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	WP-15N	500 mL	WP-15-500N

Elements	Concentration	Matrix
Ag	10 µg/mL	2% HNO_3
Sb, Tl	25 µg/mL	

Volume	Part #	Volume	Part #
125 mL	WP-3	500 mL	WP-3-500

Elements	Concentration	Matrix
K, Mg	100 µg/mL	2% HNO_3
Ba, Ca, Mo, Na	500 µg/mL	

Volume	Part #	Volume	Part #
125 mL	MN-6	500 mL	MN-6-500

Elements	Concentration	Matrix
Be, Sb, Tl	5 µg/mL	2% HNO_3
Co, Cu, Mn, Ni, Zn	10 µg/mL	
Al, Fe, V	20 µg/mL	

Volume	Part #
125 mL	WP-11

Volume	Part #
500 mL	WP-11-500

Elements	Concentration	Matrix
K, Mg	100 µg/mL	2% HNO_3
Ca, Na	500 µg/mL	

Volume	Part #
125 mL	MN-4

Volume	Part #
500 mL	MN-4-500

Set Contains	Part #
WP-15	TM-SET
WP-3	
MN-6	
PLHG2-1AY	

** Mercury is supplied as a separate solution (PLHG2-1AX/Y) due to incompatibility with other elements.*

Set Contains	Part #
WP-15N	TM-SETN
WP-3	
MN-6	

Set Contains	Part #
WP-11	AM-SET
MN-4	

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section 5

Multi-Element Standards for ICP-MS

Spex CertiPrep Claritas PPT® standards are a class of Inorganic Certified Reference Standards designed specifically for today's new generation of trace ICP and ICP-MS instrumentation. Based on extensive development, our chemists have formulated this line of high-purity standards for user convenience and stability.

Our Claritas PPT® selection of standards includes a complete series of multi-element solutions, many designed for use with US EPA Methods. These solutions are made with the highest purity materials available and are tested on our state-of-the-art ICP-MS. Spex CertiPrep Certified Reference Materials (CRMs) are manufactured under a quality system complying with the requirements of ISO 9001, ISO/IEC 17025 and ISO 17034.

CALIBRATE WITH CONFIDENCE®

Since 1954, our commitment to quality has made Spex CertiPrep the leading manufacturing of Inorganic Certified Reference Materials.

Every Claritas PPT® standard is supplied with a comprehensive SPEXertificate® which reports actual measured values in the final solution of both the major analytes and up to 68 trace element impurities at ppt levels. As always, each certificate includes NIST documentation and information regarding the methods used. Spex CertiPrep will guarantee the stability and accuracy of each Claritas PPT® standard to ± 0.5%, averaged certified analyte concentrations, for one full year from date of shipment.

The great precision, sensitivity and rapid analysis of multi-element mixtures by ICP and ICP-MS instrumentation have mandated their widespread use in environmental, agricultural, semiconductor, metallurgical, and biological laboratories. Advancements in ICP spectroscopy over recent years have extended limits of detection into the low ppb (parts per billion) range. The ICP-MS technique has provided even greater sensitivity, extending detection limits routinely into the low ppt (parts per trillion) range. No longer is one in a million good enough!

Spex CertiPrep offers a variety of customer loyalty programs. Our SPoints Program allows you to earn valuable credits every time you order. For more information, visit

.

Spex CertiPrep also offers a Loyalty Customer Discount Program to reward you with an ***automatic*** discount ranging from 5% to 20% off all qualified products.

There is no need to apply for either of these programs. You are automatically enrolled when you purchase Spex CertiPrep products!

For ICP-MS instrumentation tuning and mass calibration prior to analysis.

ICP-MS Tuning Solution 1

A dilution of 100-fold to 1,000-fold, depending on the sensitivity of the instrument, is suggested. Dilute with equal parts of Claritas PPT® Nitric Acid Blank and Water Blank to yield a 1% nitric acid matrix.

Elements	Concentration	Volume	Matrix	Part #
Ba, Be, Ce, Co, In, Li, Mg, Pb, Rh, Tl, U, Y	10 µg/mL	125 mL	5% HCl/2% HNO_3	CL-TUNE-1

ICP-MS Tuning Solution 2

A dilution of 1,000-fold is suggested. Dilute with Claritas PPT® Nitric Acid Blank and Water Blank to yield a 1% nitric acid matrix.

Elements	Concentration	Volume	Matrix	Part #
Ba, Be, Ce, Co, In, Mg, Pb, Rh, U	10 µg/mL	125 mL	2% HNO_3	CL-TUNE-2

ICP-MS Tuning Solution 3

A dilution of 1,000-fold is suggested. Dilute with Claritas PPT® Nitric Acid Blank and Water Blank to yield a 0.5% nitric acid matrix.

Elements	Concentration	Volume	Matrix	Part #
Be, Ce, Co, Fe, In, Mg, Pb, Th, U	1 µg/mL	125 mL	2% HNO_3	CL-TUNE-3
Ba	10 µg/mL			

ICP-MS Tuning Solution 4

A dilution of 100-fold to 1,000-fold is suggested. Dilute with Claritas PPT® Nitric Acid Blank to match your sample matrix.

Elements	Concentration	Volume	Matrix	Part #
Co, In, Li, Tl	10 µg/mL	125 mL	2% HNO_3	CL-TUNE-4

Calibration and Matrix Blanks

The calibration, reagent, and rinse blanks are prepared by diluting the appropriate acid with water and any necessary internal standards to produce the required acid concentration, generally 1% HNO_3. May be used for dilution or to establish baselines.

Description	Volume	Matrix	Part #
Nitric Acid Blank	125 mL	2% HNO_3	CLBLK-HNO3
	250 mL	2% HNO_3	CLBK-HNO3-250
Hydrochloric Acid Blank	125 mL	2% HCl	CLBLK-HCL
DI Water Blank	125 mL	H_2O	CLBLK-H2O
	250 mL	H_2O	CLBK-H2O-250

Dilute to the concentration appropriate for the instrument with equal parts of Claritas PPT® Nitric Acid Blank and Water Blank. For preparation every two weeks, or as needed.

Elements	Concentration	Volume	Matrix	Part #
Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Th, Tl, U, V, Zn	20 µg/mL	125 mL	5% HNO_3/tr. Tartaric Acid	CL-CAL-1

Elements	Concentration	Volume	Matrix	Part #
Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Th, Tl, U, V, Zn	10 µg/mL	125 mL	5% HNO_3/tr. Tartaric Acid	CL-CAL-1A
Se	50 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, Zn	100 µg/mL	125 mL	5% HNO_3/tr. Tartaric Acid/tr. HF	CL-CAL-2

Elements	Concentration	Volume	Matrix	Part #
Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sb, Tl, V, Zn	10 µg/mL	125 mL	5% HNO_3/tr. Tartaric Acid	CL-CAL-2A
Se	50 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
Ca, Fe, K, Mg, Na	1,000 µg/mL	125 mL	5% HNO_3	CL-CAL-3

Elements	Concentration	Volume	Matrix	Part #
Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Th, Tl, U, V, Zn	10 µg/mL	125 mL	5% HNO_3/tr. Tartaric Acid	CL-ICV-1
Ca, Fe, K, Mg, Na, Sr	1,000 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
Sn, Ti	10 µg/mL	125 mL	2% HNO_3/tr. HF	CL-ICV-2

Elements	Concentration	Volume	Matrix	Part #
Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V, Zn	10 µg/mL	125 mL	5% HNO_3/tr. Tartaric Acid	CL-ICV-3
Se	50 µg/mL			
Ca, Fe, K, Mg, Na	100 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
As, Be, Ca, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sr, Ti, Tl, V, Zn	100 µg/mL for each component	125 mL	5% HNO_3/tr. Tartaric Acid/tr. H	CL-QC-21

Elements	Concentration	Volume	Matrix	Part #
As, Be, Ca, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Ni, Sb, Tl, V, Zn	10 µg/mL	125 mL	5% HNO_3/tr. Tartaric Acid	CL-QC-21A
Se	50 µg/mL			

May be used to monitor and correct for changes that occur from differences between standards and samples. Since environmental samples often contain significant amounts of lithium, isotopically enriched 95% ^{6}Li can be analyzed as an internal standard, avoiding the signal from the ^{7}Li peak.

Elements	Concentration	Volume	Matrix	Part #
Bi, Ho, In, ^{6}Li, Sc, Tb, Y	10 µg/mL	125 mL	2% HNO_3	CLISS-1

Elements	Concentration	Volume	Matrix	Part #
Bi, Ho, In, ^{6}Li, Rh, Sc, Tb, Y	10 µg/mL	125 mL	2% HNO_3	CLISS-2

Elements	Concentration	Volume	Matrix	Part #
Bi	10 µg/mL	125 mL	2% HNO_3	CLBI2-1AY
Ge	10 µg/mL	125 mL	H_2O/tr. F^-	CLGE9-1AY
In	10 µg/mL	125 mL	2% HNO_3	CLIN2-1AY
Rh	10 µg/mL	125 mL	2% HCl	CLRH1-1AY
Sc	10 µg/mL	125 mL	2% HNO_3	CLSC2-1AY
Tb	10 µg/mL	125 mL	2% HNO_3	CLTB2-1AY
Y	10 µg/mL	125 mL	2% HNO_3	CLY2-1AY

Elements	Concentration	Matrix
Bi, Ge, In, ^{6}Li, Sc, Tb, Y	10 µg/mL	5% HNO_3

Volume	Part #
125 mL	CL-ISM1-100

Volume	Part #
500 mL	CL-ISM1-500

Elements	Concentration	Matrix
Bi, Ge, In, ^{6}Li, Lu, Rh, Sc, Tb	100 µg/mL	2% HNO_3

Volume	Part #
125 mL	CL-ISM2-100

For testing the calibration curves as Initial Calibration Verification (ICV) and Continuing Calibration Verification (CCV) solutions. The standards may be mixed and diluted as required.

Elements	Concentration	Matrix	Part #
Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn	10 µg/mL	2% HNO_3/tr. Tartaric Acid/ tr. HF	CL-ICS-1

Elements	Concentration	Matrix	Part #
Mo, Th, U	10 µg/mL	2% HNO_3	CL-ICS-4

Elements	Concentration	Matrix	Part #
Hg	10 µg/mL	5% HNO_3	CLHG2-1AY

Elements	Concentration	Matrix	Part #
Ca, Fe, K, Mg, Na	200 µg/mL	2% HNO_3	CL-ICS-3

Elements	Concentration	Matrix	Part #
Mo, Sn, Sr, Ti	10 µg/mL	2% HNO_3/tr. HF	CL-ICS-5

Set Contains	Part #
CL-ICS-1	CL-ICS-SET
CL-ICS-3	
CL-ICS-4	
CL-ICS-5	
CLHG2-1AY	

Designed to contain virtually every element in the mass spectrum for concentration verification checks.

Elements	Concentration	Matrix	Part #
Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Th, Tm, Y, Yb	10 µg/mL	5% HNO_3	CLMS-1

Elements	Concentration	Matrix	Part #
Ag, Al, As, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Ga, Hg*, In, K, Li, Mg, Mn, Na, Ni, Pb,m Rb, Se, Sr, Tl, U, V, Zn	10 µg/mL	5% HNO_3	CLMS-2

** Mercury is supplied as a separate solution (CLHG2-1AY) due to incompatibility with other elements.*

Elements	Concentration	Matrix	Part #
Ag, Al, As, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Fe, Ga, In, K, Li, Mg, Mn, Na, Ni, Pb,m Rb, Se, Sr, Tl, U, V, Zn	10 µg/mL	5% HNO_3	CLMS-2N

Elements	Concentration	Matrix	Part #
Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, Hg*, K, Li, Mg, Mn, Na, Ni, Pb, Rb, Se, Sr, Tl, U, V, Zn	10 µg/mL	5% HNO_3	CLMS-2A

** Mercury is supplied as a separate solution (CLHG2-1AY) due to incompatibility with other elements.*

Elements	Concentration	Matrix	Part #
Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, K, Li, Mg, Mn, Na, Ni, Pb, Rb, Se, Sr, Tl, U, V, Zn	10 µg/mL	5% HNO_3	CLMS-2AN

Elements	Concentration	Matrix	Part #
Au, Hf, Ir, Pd, Pt, Rh, Ru, Sb, Sn, Te	10 µg/mL	10% HCl/1% HNO_3	CLMS-3

Designed to contain virtually every element in the mass spectrum for concentration verification checks.

Elements	Concentration	Matrix	Part #
B, Ge, Mo, Nb, P, Re, S, Si, Ta, Ti, W, Zr	10 µg/mL	H_2O/tr. HF/tr. HNO_3	CLMS-4

Elements	Concentration	Matrix	Part #
Be, Bi, Ce, Co, In, Mg, Ni, Pb, U	10 µg/mL	2% HNO_3	CLMS-5

Set Contains	Part #
CLMS-1	CLMS-SET
CLMS-2	
CLMS-3	
CLMS-4	
CLBLK-HNO3	
CLBLK-HCL	
CLBLK-H2O	
CLHG2-1AY	

Set Contains	Part #
CLMS-1	CLMS-SETN
CLMS-2N	
CLMS-3	
CLMS-4	
CLBLK-HNO3	
CLBLK-HCL	
CLBLK-H2O	

** Mercury is supplied as a separate solution (CLHG2-1AY) due to incompatibility with other elements.*

To identify or confirm the maximum concentration of an analyte that does not cause a memory effect greater than the contract required detection limit (CRDL). The test solutions are not analyzed directly; equal volumes of the two are mixed and then introduced into the instrument for a normal sample exposure time. A blank is then run to confirm that all analyte memory effects are below the CRDL.

Elements	Concentration	Matrix	Part #
Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Se, Tl, V, Zn	20 µg/mL	5% HNO_3	CL-MEM-1
Al, Ca, Fe, K, Mg, Na	1,000 µg/mL		

Elements	Concentration	Matrix	Part #
Mo, Sb, Ti	20 µg/mL	H_2O/tr. HF	CL-MEM-2
P, S	1,000 µg/mL		
C	2,000 µg/mL		
Cl	7,200 µg/mL		

Contents	Part #
CL-MEM-1	CL-MEM-SET
CL-MEM-2	

May be run between samples to reduce the memory effect rising from mercury. It is recommended that a solution of gold is five times the concentration of the mercury in the prior sample run.

Element	Concentration	Matrix	Part #
Au	100 µg/mL	2% HCl	CLAU1-1Y

Designed for addition to a matrix blank prior to digestion for both water and soil. An aliquot of the respective Spike Standard should be added to produce the proper concentration levels in the digestate.

Elements	Concentration	Matrix	Part #
Ag, Be, Cd, Se, Tl	25 µg/mL	5% HNO_3/tr. Tartaric Acid/ tr. HF	CL-SPIKE-1
As, Pb	50 µg/mL		
Co, Cr, Cu, Mn, Ni, Sb, V	100 µg/mL		
Ba, Zn	250 µg/mL		
Fe	500 µg/mL		

Elements	Concentration	Matrix	Part #
Ag, Be, Se, Tl	25 µg/mL	5% HNO_3/tr. Tartaric Acid/ tr. HF	CL-SPIKE-2
As, Cd	50 µg/mL		
Co, Pb, Sb	100 µg/mL		
Ni	125 µg/mL		
V	150 µg/mL		
Ba, Cr, Cu, Zn	250 µg/mL		

Spex CertiPrep Claritas PPT® Isotope Standards can be used for isotope dilution analysis and internal standards. The internal standard element must have similar characteristics to the tested/measured element(s) and not be present in the sample. Using isotope modification standards, the chemist can use less internal standard and have a higher intensity reading while avoiding interferences.

Every Claritas PPT® standard is supplied with a comprehensive SPEXertificate® which reports actual measured values in the final solution of both the major analytes and up to 68 trace elemental impurities at ppt levels.

Spex CertiPrep will guarantee the stability and accuracy of each Claritas PPT® standard to ± 0.5%, averaged labeled analyte concentrations, for one full year from date of shipment.

Additionally, the SPEXertificate® for the isotope standard will consist of:

- The isotope ratio measured by ICP-MS
- The concentration of each isotope calculated by ICP-MS and measured by ICP

Elements	Concentration	Volume	Matrix	Part #
Boron 10	10 µg/mL	125 mL	H_2O	ISOT-B10
Boron 11	10 µg/mL	125 mL	H_2O	ISOT-B11
Copper 65	10 µg/mL	125 mL	2% HNO_3	ISOT-CU65
Lithium 6	10 µg/mL	125 mL	2% HNO_3	ISOT-LI6
Lead 206	10 µg/mL	125 mL	2% HNO_3	ISOT-PB206
Lead 207	10 µg/mL	125 mL	2% HNO_3	ISOT-PB207
Strontium 86	10 µg/mL	125 mL	2% HNO_3	ISOT-SR86
Zinc 68	10 µg/mL	125 mL	2% HNO_3	ISOT-ZN68

Don't forget your Gold Blank Standard, CLAU1-1Y
(see page 62), to reduce the memory effect of mercury!

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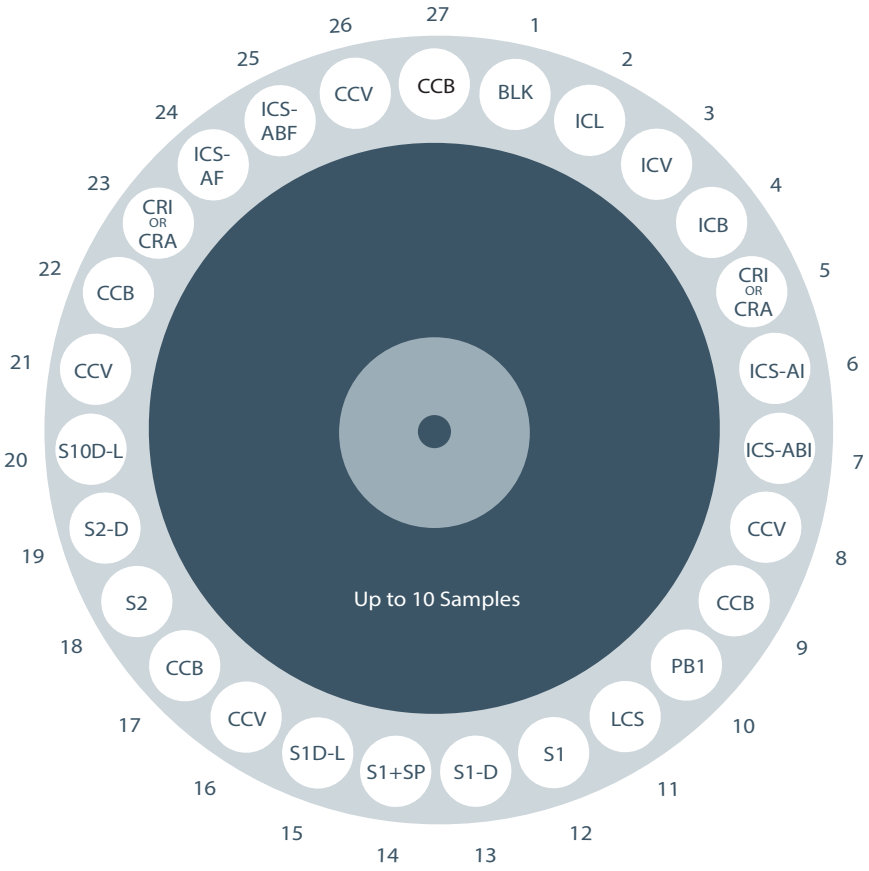
section 6

Our Contract Laboratory Program (CLP) standards allow you to Calibrate with Confidence®. The following standards are to be used in conjunction with the Statement of Work for Inorganic Analysis; Multi-Media/Multi-Concentration Document Number ILM 05.3/ISM 01.2.

The final ICP check, performed in our own laboratories, is your stamp of assurance. We calibrate our instruments with traceable reference materials and show you the actual found value of the solution you receive, not just an ideal, calculated number as so many other standards manufacturers do. The section that follows contains multi-element standards referenced to their application. The combination of elements, concentrations, and matrices listed have been designed by Spex CertiPrep for convenience of use and stability.

The US EPA SOW ILM 05.3/ISM 01.2 gives specific procedures for the methods of analysis, target elements, and concentration levels. Standards are specified not only by the elements present and their relative concentrations, but also the order and frequency of running standards, blanks and samples. Details of these specifications may be found in the US EPA SOW ILM 05.3/ISM 01.2 in the following sections:

- Exhibit C, Inorganic Target Analyte List (TAL)
- Exhibit D, Analytical Methods
- Exhibit E, QA/QC Requirements



Following is a list of samples, standards and blanks in a possible running sequence as suggested by the Contract Laboratory Program protocols as seen on page 65. Also listed are the Spex CertiPrep standards and solutions to be used in preparing the final blanks, standards and spikes. Complete descriptions of each solution are provided on the following pages.

Blank: PLBLKs

Initial Calibration Solution: Mixture of ICALs

Initial Calibration Verification: ICV-1A

Initial Calibration Blank (not digested): PLBLKs

CRDL-2

Initial Interferents, A: INT-A1

Initial Interferents and Analytes, AB: INT-A1, INT-B3

Continuing Calibration Verification (50% ICV): ICV-1A

Continuing Calibration Blank: PLBLKs (if results of CCV and CCB are within limits, proceed to next sample, if not, stop run)

Preparation Blank: Digested Water or Soil Blank

Laboratory Control Sample (digested): ICV-1A

Sample #1

Sample #1 Duplicate

Sample #1 with SPIKE: SPIKE-1

Sample #1 Diluted Five-Fold

Continuing Calibration Verification (50% ICV): ICV-1A

Continuing Calibration Blank: PLBLKs (if results of CCV and CCB are within limits, proceed to next sample, if not, stop run)

Sample #2

Sample #2 Duplicate (up to 10 samples may be run as long as CCV and CCB tests are within accepted limits)

Sample #10 Diluted Five-Fold

Continuing Calibration Verification (50% ICV): ICV-1A

Continuing Calibration Blank PLBLKs (if results of CCV and CCB are within limits, proceed to next sample, if not, stop run)

2 x Contract Required Detection Limits: CRDL-1

Final Interferents, A: INT-A1

Final Interferents and Analytes, AB: INT-A1, INT-B3

Continuing Calibration Verification (50% ICV): ICV-1A

Continuing Calibration Blank: PLBLKs

May be used separately or mixed together for preparation of the analytical curve. When mixed, these solutions will yield a standard containing all of the elements in the Target Analyte List (TAL). Instruments must be calibrated daily, every 24 hours, or each time the instrument is set-up. Calibration standards must be prepared fresh for each analysis and discarded after use. A dilution of 100-fold is suggested for ICAL-2, ICAL-3 and ICAL-4A, and a dilution of 10-fold for ICAL-1. Antimony and mercury can be diluted as required.

For ISM 01.2, at least one of your calibration standards must be at the Contract Required Quantification Limit (CRQL). See ISM 01.2 sections for CRQL standards.

Applies to part numbers ICAL-1, ICAL-2, ICAL-3, ICAl-4A, ICAL-4A-500, PLSB7-2Y, and PLHG2-1Y.

The US EPA retains analytical services through the Contract Laboratory Program (CLP). The CLP follows detailed SOPs derived from EPA methods. The CLP methods require calibration of analytical instrumentation within the expected quantitative range (ICAL standards) and additional CLP QA standards (ICV standards) to verify the calibration curve at each of the selected wavelengths that will be used for sample analysis.

Our verification standards, ICV-1A, ICV-2 and ICV-3, contain all of the elements on the TAL list and are independent standards for testing an instruments calibration curve. Spex CertiPrep's ICV standards are designed to be used with their corresponding instrument calibration standards (ICAL). Refer to page 71 for a complete list of ICAL standards.

We recommend dilution of ICV standards to a range within your instruments calibration curve. A dilution of 200-fold is recommended for ICV-2A, PLSB7-2X and ICV-2C. A dilution of 20-fold is recommended for ICV-1A and ICV-3.

Applies to part numbers ICV-1A and ICV-3.

CLP ISM 01.2 & ILM 05.3 Standards for ICP

For ILM 05.3, a standard must be run at the Contract Required Detection Limits (CRDL). To verify linearity near the CRQL, this standard is analyzed at the beginning of the analysis run, after the ICV/ICB and before the ICSA and ICSAB. In addition, this standard must be run at a frequency of not less than 20 analytical samples and at the end of the analysis run, followed by the ICSA/ISCAB. The sequence order is CCV, CCB, CRI, ICSA, ICSAB, CCV, and CCB.

For ISM 01.2, at least one of your calibration standards must be at the Contract Required Detection Limit (CRDL). This standard, when diluted, can be used as a calibration standard to fulfill this requirement.

Applies to part numbers CRDL-2 and CRDL-2A.

CLP ISM 01.2 Standards for ICP-MS

For ISM 01.2, at least one of your calibration standards must be at the Contract Required Detection Limit (CRDL). This standard, when diluted, can be used as a calibration standard to fulfill this requirement.

Applies to part numbers CL-CRDL-2.

CLP ILM 05.3 Standards for ICP-MS

A standard must be run at the Contract Required Detection Limits (CRDL). To verify linearity near the CRQL, this standard is analyzed at the beginning of the analysis run after the ICV/ICB and before the ICSA and ICSAB. In addition, this standard must be run at a frequency of not less than 20 analytical samples and at the end of the analysis run, followed by the ICSA/ICSAB. The sequence order is CCV, CCB, CRI, ICSA, ICSAB, CCV, CCB.

Applies to part numbers CL-CRDL-2

CLP ILM 02.0 & 05.2 Standards for ICP and CLP-M/6020/SW-846 Standards for ICP-MS

A standard must be run at two times the Contract Required Detection Limits (CRDL), or at two times the Instrument Detection Limits (IDL), whichever is greater. This standardization is performed at the start and the end of each sample analysis or at least twice in each eight hour shift.

All elements to be analyzed must be run except Al, Ba, Ca, Fe, K, Mg, and Na.

Our CRDL-1 and CL-CRDL-1standards contain all of the required elements on the TAL, in their appropriate concentration ratios. CRDL-1 should be diluted by a factor of 1,000 prior to use in the "two times CRDL" run for ICP-AES analysis. For analysis by atomic absorption, CRDL-1 should be diluted by a factor of 2,000 prior to use in the "one time CRDL" run. CL-CRDL-1 should be diluted by a factor of 1,000 prior to use in the "two times CL-CRDL" run for ICP analysis. For analysis by atomic absorption, CL-CRDL-1 should be diluted by a factor of 2,000 prior to use in the "one time CL-CRDL" run.

Applies to part number CRDL-1 and CL-CRDL-1.

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP

For verification of inter-element and background correction factors at the beginning and the end of each analysis run. In addition, a verification must be done after every 20th sample. Two solutions are required for the most common interference check: Solution A, the interferents alone (INT-A1) and Solution AB, a combination of interferents (INT-A1) and analytes (INT-B3). Solution A is prepared by diluting INT-A1 20-fold. Solution AB is prepared by diluting INT-A1 20-fold and INT-B3 100-fold; for example, 5 mL of INT-A1 and 1 mL of INT-B3 into a 100 mL volumetric flask, brought to volume with a matrix blank (see pages 22 & 40). Once prepared, the solutions should be analyzed consecutively, starting with Solution A.

Applies to part numbers INT-A1 and INT-B3.

CLP ILM 02.0 Standards for ICP

For verification of inter-element and background correction factors at the beginning and the end of each analysis run. In addition, a verification must be done after every 20th sample. Two solutions are required for the most common interference check: Solution A, the interferents alone (INT-A1) and Solution AB, a combination of interferents (INT-A1) and analytes (INT-B1). Solution A is prepared by diluting INT-A1 20-fold. Solution AB is prepared by diluting INT-A1 20-fold and INT-B1 100-fold; for example, 5 mL of INT-A1 and 1 mL of INT-B1 into a 100 mL volumetric flask, brought to volume with a matrix blank (see pages 22 & 40). Once prepared, the solutions should be analyzed consecutively, starting with Solution A.

Applies to part numbers INT-A1 and INT-B1.

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP-MS

For verification of inter-element and background correction factors at the beginning and the end of each analysis run. In addition, a verification must be done after every 20th sample. Two solutions are required for the most common interference check: Solution A, the interferents alone (CL-INT-A2) and Solution AB, a combination of interferents (CL-INT-A2) and analytes (CL-INT-B3 or CL-INT-B4). Solution A is prepared by diluting CL-INT-A2 10-fold. Solution AB is prepared by diluting CL-INT-A2 10-fold and CL-INT-B3 or CL- INT-B4 100-fold; for example, 10 mL of CL-INT-A2 and 1 mL of CL-INT-B3 or CL-INT-B4 into a 100 mL volumetric flask, brought to volume with a matrix blank (see pages 22 & 40). Once prepared, the solutions should be analyzed consecutively, starting with Solution A.

Applies to part numbers CL-INT-A2, CL-INT-B3, CL-INT-B3N, and CL-INT-B4.

CLP-M/6020/SW-846 Standards for ICP-MS

For verification of inter-element and background correction factors at the beginning and the end of each analysis run. In addition, a verification must be done after every 20th sample. Two solutions are required for the most common interference check: Solution A, the interferents alone (CL-INT-A1) and Solution AB, a combination of interferents (CL-INT-A1) and analytes (CL-INT-B1). Solution A is prepared by diluting CL-INT-A1 20-fold. Solution AB is prepared by diluting CL-INT-A1 20-fold and CL-INT-B1 100-fold; for example, 5 mL of CL-INT-A1 and 1 mL of CL-INT-B1 into a 100 mL volumetric flask, brought to volume with a matrix blank (see pages 22 & 40). Once prepared, the solutions should be analyzed consecutively, starting with Solution A.

Applies to part numbers CL-INT-A1 and CL-INT-B1.

Alternate Standards

We also provide a solution of alternate interferents and alternate analytes. Alternate interferents A (INT-A2) and alternate analytes B (INT-B2) may be prepared in combination with the INT-A1 and INT-B3 solutions mentioned, or any combination involving the four solutions, depending on the analytes and interferents of interest to you.

We provide ICP-MS interferents and interferent check solutions for SW-845.

Applies to part numbers INT-A2, INT-B2, CL-INT-A3, and CL-INT-B2.

In the spike sample analysis, a spike containing the required elements, in their respective amount, is added to the sample prior to addition of any reagents, digestions, distillation, etc. Information is then provided on the effects of the sample matrix and the entire methodology.

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP

Our spike standard, SPIKE-4, provides all of the analytes required for the IC, ICP-AES and the AA spike.

Applies to part numbers SPIKE-4.

CLP ILM 02.0 Standards for ICP

Our spike standard, SPIKE-1, provides all of the analytes required for the ICP-AES and the AA spike. Add 1 mL of SPIKE-1 to aqueous samples and 2 mL of SPIKE-1 to solid samples prior to digestion.

Applies to part numbers SPIKE-1 and SPIKE1-500.

CLP ILM 05.2 Standards for ICP-MS

Our spike standard, CL-SPIKE-3, provides all of the analytes required for the ICP and AA spike.

Applies to part number CL-SPIKE-3.

CLP ISM 01.2 Standards for ICP-MS

Our spike standard, CL-SPIKE-4, provides all of the analytes required for the ICP-MS and the AA spike. Add 1 mL of CL-SPIKE-4 to aqueous samples and 2 mL of CL-SPIKE-4 to solid samples prior to digestion.

Applies to part number CL-SPIKE-4.

CLP ILM 05.3 Standards for ICP-MS

Our spike standard, CL-SPIKE-4, provides all of the analytes required for the ICP-MS.

Applies to part number CL-SPIKE-4.

CLP-M/6020/SW-846 Standards for ICP-MS

Our spike standards, CL-SPIKE-1 and CL-SPIKE-2, provide all of the analytes required for ICP-MS. Add 1 mL of CL-SPIKE-1 to aqueous samples and 2 mL of CL-SPIKE-2 to solid samples prior to digestion.

Applies to part numbers CL-SPIKE-1 and CL-SPIKE-2.

See page 67 for details.

Elements	Concentration	Matrix	Volume	Part #
Ca, K, Mg, Na	5,000 µg/mL	5% HNO_3	125 mL	ICAL-1

Elements	Concentration	Matrix	Volume	Part #
Ag, Cr	100 µg/mL	5% HNO_3	125 mL	ICAL-2
Mn	150 µg/mL			
Zn	200 µg/mL			
Ni	400 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Be	50 µg/mL	5% HNO_3	125 mL	ICAL-3
Cu	250 µg/mL			
Co, V	500 µg/mL			
Fe	1,000 µg/mL			
Al, Ba	2,000 µg/mL			

Elements	Concentration	Matrix
Pb	30 µg/mL	5% HNO_3
Cd, Se	50 µg/mL	
As, Tl	100 µg/mL	

Volume	Part #	Volume	Part #
125 mL	ICAL-4A	500 mL	ICAL-4A-500

The following dilutions are suggested: a dilution of 250-fold for ICAL-1; 100-fold for ICAL-2 and ICAL-3; 20-fold for ICAL-4A. Antimony and mercury can be diluted as required.

See page 67 for details.

Elements	Concentration	Matrix	Volume	Part #
Hg	100 µg/mL	5% HNO_3	125 mL	PLHG2-1Y
Sb	1,000 µg/mL	H_2O/0.6% Tartaric Acid/tr. HNO_3	125 mL	PLSB7-2Y

See page 67 for details.

Elements	Concentration	Matrix	Volume	Part #
Pb	3 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	500 mL	ICV-1A
Be, Cd, Se	5 µg/mL			
Ag, As, Cr, Tl	10 µg/mL			
Mn	15 µg/mL			
Zn	20 µg/mL			
Cu	25 µg/mL			
Ni	40 µg/mL			
Co, V	50 µg/mL			
Sb	60 µg/mL			
Fe	100 µg/mL			
Al, Ba	200 µg/mL			
Ca, K, Mg, Na	5,000 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Be	5 µg/mL	5% HNO_3	500 mL	ICV-3
Cr	20 µg/mL			
Ag, Cu	25 µg/mL			
Cd, Co, Mn, Ni, V, Zn	50 µg/mL			
As, Fe, Pb, Se, Tl	100 µg/mL			
Al, Ba	200 µg/mL			
Ca, K, Mg, Na	500 µg/mL			

Having trouble finding the Multi-Element Standard you need?
Fill out the Custom Standard Request Form at

CLP ISM 01.2 and ILM 05.3 Standards for ICP

See page 67 for details.

Elements	Concentration	Matrix	Volume	Part #
Be, Cd	10 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CRDL-2
As, Cr, Pb, Ag	20 µg/mL			
Mn	30 µg/mL			
Cu, Tl	50 µg/mL			
Se	70 µg/mL			
Ni	80 µg/mL			
Co, V	100 µg/mL			
Sb, Zn	120 µg/mL			
Fe	200 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Al, Ba	200 µg/mL	10% HNO_3	125 mL	CRDL-2A
Ca, K, Mg, Na	5,000 µg/mL			

CLP ISM 01.2 and ILM 05.3 Standards for ICP-MS

See page 67 for details.

Elements	Concentration	Matrix	Volume	Part #
Ag, As, Be, Cd, Co, Mn, Ni, Pb, Tl	2 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-CRDL-2
Cr, Cu, Sb, Zn	4 µg/mL			
Se, V	10 µg/mL			
Ba	20 µg/mL			
Al	40 µg/mL			
Fe	400 µg/mL			
Ca, K, Mg, Na	1,000 µg/mL			

How do I prevent my antimony oxide (Sb_2O_3) solution from becoming a gelatin when I dissolve it in tartaric acid?

While Sb_2O_3 dissolves easily in tartaric acid and water, the solution is clear at first but a gelatin-like substance can form over time. This is a form of mold. Adding a trace amount of nitric acid to the solution can prevent this.

CLP ILM 02.0 & 05.2 Standards for ICP and CLP-M/6020/SW-846 Standards for ICP-MS

See page 68 for details.

Elements	Concentration	Matrix	Volume	Part #
Pb	6 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CRDL-1
Be, Cd, Se	10 µg/mL			
Ag, As, Cr, Tl	20 µg/mL			
Mn	30 µg/mL			
Zn	40 µg/mL			
Cu	50 µg/mL			
Ni	80 µg/mL			
Co, V	100 µg/mL			
Sb	120 µg/mL			

CLP-M/6020/SW-846 Standards for ICP-MS

See page 68 for details.

Elements	Concentration	Matrix	Volume	Part #
Pb	0.3 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-CRDL-1
Be, Cd, Se	0.5 µg/mL			
Ag, As, Cr, Tl	1 µg/mL			
Mn	1.5 µg/mL			
Zn	2 µg/mL			
Cu	2.5 µg/mL			
Ni	4 µg/mL			
Co, V	5 µg/mL			
Sb	6 µg/mL			
Fe	10 µg/mL			
Al, Ba	20 µg/mL			
Ca, K, Mg, Na	500 µg/mL			

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP

See page 68 for details.

Elements	Concentration	Matrix	Volume	Part #
Fe	2,000 µg/mL	5% HNO_3	500 mL	INT-A1
Al, Ca, Mg	5,000 µg/mL			

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP

See page 68 for details.

Elements	Concentration	Matrix	Volume	Part #
Pb, Se	5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	INT-B3
As, Tl	10 µg/mL			
Ag	20 µg/mL			
Ba, Be, Co, Cr, Cu, Mn, V	50 µg/mL			
Sb	60 µg/mL			
Cd, Ni, Zn	100 µg/mL			

CLP ILM 02.0 Standards for ICP

See page 68 for details.

Elements	Concentration	Matrix	Volume	Part #
Fe	2,000 µg/mL	5% HNO_3	500 mL	INT-A1
Al, Ca, Mg	5,000 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Ba, Be, Co, Cr, Cu, Mn, V	50 µg/mL	5% HNO_3	125 mL	INT-B1
Ag, Cd, Ni, Pb, Zn	100 µg/mL			

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP-MS

See page 68 for details.

Elements	Concentration	Matrix	Volume	Part #
Mo, Ti	20 µg/mL	5% HNO_3/tr. HF	125 mL	CL-INT-A2
Al, Ca, Fe, K, Mg, Na, P, S	1,000 µg/mL			
C	2,000 µg/mL			
Cl	10,000 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Ag, As, Ba, Be, Cd, Co, Cr, Cu, Hg*, Mn, Ni, Pb, Sb, Se, Tl, V, Zn	2 µg/mL	2% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-INT-B3

** Mercury is supplied as a separate solution (CLHG2-1AY) due to incompatibility with other elements.*

Elements	Concentration	Matrix	Volume	Part #
Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V, Zn	2 µg/mL	2% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-INT-B3N

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP-MS

See page 68 for details.

Elements	Concentration	Matrix	Volume	Part #
Ag, As, Ba, Be, Cd, Co, Sb, Se, Tl, V	20 µg/mL	5% HNO_3/tr. HF	125 mL	CL-INT-B4
Cu, Pb, Ni	25 µg/mL			
Mn, Zn	30 µg/mL			
Cr	40 µg/mL			

CLP-M/6020/SW-846 Standards for ICP-MS

See page 69 for details.

Elements	Concentration	Matrix	Volume	Part #
Mo, Ti	20 µg/mL	5% HNO_3/tr. HF	125 mL	CL-INT-A1
Al, K, Mg, P, S	1,000 µg/mL			
C	2,000 µg/mL			
Fe, Na	2,500 µg/mL			
Ca	3,000 µg/mL			
Cl	21,215 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Ag	5 µg/mL	2% HNO_3	125 mL	CL-INT-B1
As, Cd, Se, Zn	10 µg/mL			
Co, Cr, Cu, Mn, Ni, V	20 µg/mL			

CLP ILM 02.0 Standards for ICP

See page 69 for details.

Elements	Concentration	Matrix
Ag, Be, Cd	5 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF
Cr	20 µg/mL	
Cu	25 µg/mL	
Co, Mn, Ni, Pb, Sb, V, Zn	50 µg/mL	
Fe	100 µg/mL	
Al, As, Ba, Se, Tl	200 µg/mL	

Volume	Part #	Volume	Part #
125 mL	SPIKE-1	500 mL	SPIKE-1-500

CLP ILM 05.2 Standards for ICP-MS

See page 69 for details.

Elements	Concentration	Matrix	Volume	Part #
Se	1 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-SPIKE-3
Pb	2 µg/mL			
As	4 µg/mL			
Ag, Be, Cd, Tl	5 µg/mL			
Sb	10 µg/mL			
Cr	20 µg/mL			
Cu	25 µg/mL			
Co, Mn, Ni, V, Zn	50 µg/mL			
Al, Ba	200 µg/mL			

CLP ISM 01.2 and ILM 05.2 & 05.3 Standards for ICP

See page 69 for details.

Elements	Concentration	Matrix	Volume	Part #
Pb	2 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	SPIKE-4
As	4 µg/mL			
Ag, Be, Cd, Se, Tl	5 µg/mL			
Sb	10 µg/mL			
Cr	20 µg/mL			
Cu	25 µg/mL			
Co, Mn, Ni, V, Zn	50 µg/mL			
Fe	100 µg/mL			
Al, Ba	200 µg/mL			

CLP-M/6020/SW-846 Standards for ICP-MS

See page 70 for details.

Elements	Concentration	Matrix	Volume	Part #
Ag, Be, Cd, Se, Tl	25 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-SPIKE-1
As, Pb	50 µg/mL			
Co, Cr, Cu, Mn, Ni, Sb, V	100 µg/mL			
Ba, Zn	250 µg/mL			
Fe	500 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Ag, Be, Se, Tl	25 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-SPIKE-2
As, Cd	50 µg/mL			
Co, Pb, Sb	100 µg/mL			
Ni	125 µg/mL			
V	150 µg/mL			
Ba, Cr, Cu, Zn	250 µg/mL			

CLP ISM 01.2 and ILM 05.3 Standards for ICP-MS

See pages 69-70 for details.

Elements	Concentration	Matrix	Volume	Part #
Se	1 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	CL-SPIKE-4
Pb	2 µg/mL			
As	4 µg/mL			
Be, Cd, Ag, Tl	5 µg/mL			
Sb	10 µg/mL			
Cr	20 µg/mL			
Cu	25 µg/mL			
Co, Mn, Ni, V, Zn	50 µg/mL			
Fe	100 µg/mL			
Al, Ba	200 µg/mL			

Interference Checks

See page 69 for details.

Elements	Concentration	Matrix	Volume	Part #
Cr, Cu, Mn, Ni, Ti, V	1,000 µg/mL	5% HNO_3/tr. F^-	500 mL	INT-A2

Elements	Concentration	Matrix	Volume	Part #
Ca, Fe, Mg, Si	10 µg/mL	5% HNO_3/tr. Tartaric Acid/tr. HF	125 mL	INT-B2
Al, As, B, Mo, Na, Sb, Se, Tl	100 µg/mL			

Elements	Concentration	Matrix	Volume	Part #
Ag, As, Cd, Co, Cr, Cu, Mn, Ni, Zn	10 µg/mL	2% HNO_3	125 mL	CL-INT-B2

Elements	Concentration	Matrix	Volume	Part #
Mo, Ti	20 µg/mL	5% HNO_3/tr. HF	125 mL	CL-INT-A3
Al, Mg, P, K, S	1,000 µg/mL			
C	2,000 µg/mL			
Fe, Na	2,500 µg/mL			
Ca	3,000 µg/mL			
Cl	20,000 µg/mL			

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section 7

Heavy Metals & Minerals Testing Kits

Heavy Metals and Minerals Testing Kits are designed for routinely analyzed heavy metals and minerals. All kits come with six, 30 mL standards which includes a nitric acid blank for easy dilution. Conveniently packaged in a sturdy, heavy-duty carton, these kits are perfect to store on a lab bench or in a cabinet. The 30 mL standards ship non-hazardous, saving money on shipping costs. The smaller volume also allows for less hazardous waste should the standard expire before its contents are used.

Description	Concentration	Volume	Matrix	Part #
Arsenic (CLAS2-2M)	1,000 µg/mL	30 mL each	2% HNO_3	SPXHM-KIT
Cadmium (CLCD2-2M)	1,000 µg/mL		2% HNO_3	
Chromium (CLCR2-2M)	1,000 µg/mL		2% HNO_3	
Lead (CLPB2-2M)	1,000 µg/mL		2% HNO_3	
Mercury (CLHG4-2M)	1,000 µg/mL		10% HNO_3	
Nitric Acid Blank (CLBLK-HNO3M)	-		2% HNO_3	

Description	Concentration	Volume	Matrix	Part #
Calcium (CLCA2-2M)	1,000 µg/mL	30 mL each	2% HNO_3	SPXMT-KIT
Iron (CLFE2-2M)	1,000 µg/mL		2% HNO_3	
Magnesium (CLMG2-2M)	1,000 µg/mL		2% HNO_3	
Potassium (CLK2-2M)	1,000 µg/mL		2% HNO_3	
Sodium (CLNA2-2M)	1,000 µg/mL		2% HNO_3	
Nitric Acid Blank (CLBLK-HNO3M)	-		2% HNO_3	

Spex CertiPrep is proud to announce the installation of over 335 Solar Panels on the roof of our Metuchen, NJ headquarters. This system produces 85 kW of electricity, removing our reliance on power from fossil fuels and other sources. We are committed to helping keep our planet green, and this is just our latest green initiative. For more information, visit .

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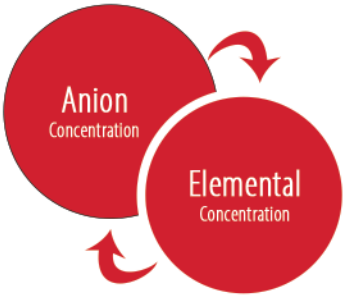
section 8

Ion chromatography (IC) is an analytical process for the separation of ions based on charge affinity. IC can be used for a variety of different kinds of charged analytes from single elements to large proteins. In order to ensure accurate analysis, quality standards which are traceable and stable are necessary. Spex CertiPrep offers the highest quality IC standards available for the analytical laboratory.

Helpful Hint: When calculating gravimetric factors for Ion Chromatography standards, remember that:



Anion Concentration		Elemental Concentration
1,000 µg/mL Nitrate	=	226 µg/mL Nitrogen
1,000 µg/mL Nitrite	=	305 µg/mL Nitrogen
1,000 µg/mL Phosphate	=	326 µg/mL Phosphorus
1,000 µg/mL Sulfate	=	334 µg/mL Sulfur
1,000 µg/mL Nitrogen as Nitrate	=	1,000 µg/mL Nitrogen
1,000 µg/mL Nitrogen as Nitrite	=	1,000 µg/mL Nitrogen
1,000 µg/mL Phosphorus as Phosphate	=	1,000 µg/mL Phosphorus
1,000 µg/mL Sulfur as Sulfate	=	1,000 µg/mL Sulfur

Specifications of four types of ASTM Water

ASTM Type	I	II	III	IV
Total Matter (µg/mL)	< 0.1	0.1	1	2
Specific Resistance (megaohm/cm) (max)	18	1	4	0.2
pH	N/A	N/A	N/A	N/A
Color Retention Time of $KMnO_4$ (min)	60	60	10	10
Total Silica (µg/L) (max)	3	3	500	High
Total Organic Carbon (µg/L) (max)	50	50	200	N/A

Anions	Concentration	Volume	Matrix	Part #
Acetate ($C_2H_3O_2$)$^-$	1,000 µg/mL	125 mL	H_2O	AS-ACE9-2Y
		500 mL		AS-ACE9-2X
Bromate (BrO_3)$^-$	1,000 µg/mL	125 mL	H_2O	AS-BRO39-2Y
		500 mL		AS-BRO39-2X
Bromide (Br-)	1,000 µg/mL	125 mL	H_2O	AS-BR9-2Y
		500 mL		AS-BR9-2X
Chlorate (ClO_3)$^-$	1,000 µg/mL	125 mL	H_2O	AS-CLO39-2Y
		500 mL		AS-CLO39-2X
Chloride (Cl)$^-$	100 µg/mL	125 mL	H_2O	AS-CL9-1Y
		500 mL		AS-CL9-1X
	1,000 µg/mL	125 mL		AS-CL9-2Y
		500 mL		AS-CL9-2X
Chlorite (ClO_2)$^-$	1,000 µg/mL	125 mL	H_2O	AS-CLO29-2Y
		500 mL		AS-CLO29-2X
Chromate (CrO_4)$^{-2}$	1,000 µg/mL	125 mL	H_2O	AS-CRO49-2Y
		500 mL		AS-CRO49-2X
Fluoride (F)$^-$	100 µg/mL	125 mL	H_2O	AS-F9-1Y
		500 mL		AS-F9-1X
	1,000 µg/mL	125 mL		AS-F9-2Y
		500 mL		AS-F9-2X
Formate (HCO_2)$^-$	1,000 µg/mL	125 mL	H_2O	AS-HCO29-2Y
		500 mL		AS-HCO29-2X
Iodide (I)$^-$	1,000 µg/mL	125 mL	H_2O	AS-I9-2Y
		500 mL		AS-I9-2X
Nitrate (NO_3)$^-$	1,000 µg/mL	125 mL	H_2O	AS-NO39-2Y
		500 mL		AS-NO39-2X
Nitrate-Nitrogen	1,000 µg/mL	125 mL	H_2O	AS-NO3N9-2Y
		500 mL		AS-NO3N9-2X
Nitrite (NO_2)$^-$	1,000 µg/mL	125 mL	H_2O	AS-NO29-2Y
		500 mL		AS-NO29-2X
Nitrite-Nitrogen	1,000 µg/mL	125 mL	H_2O	AS-NO2N9-2Y
		500 mL		AS-NO2N9-2X
Ammonia Nitrogen	1,000 µg/mL	125 mL	H_2O	AS-NH3N9-2Y
Oxalate (C_2O_4)$^{-2}$	1,000 µg/mL	125 mL	H_2O	AS-C2O49-2Y
		500 mL		AS-C2O49-2X
Perchlorate (ClO_4)$^-$	1,000 µg/mL	125 mL	H_2O	AS-CLO49-2Y
Phosphate (PO_4)$^{-3}$	1,000 µg/mL	125 mL	H_2O	AS-PO49-2Y
		500 mL		AS-PO49-2X
Phosphate-Phosphorus	1,000 µg/mL	125 mL	H_2O	AS-PO4P9-2Y
		500 mL		AS-PO4P9-2X
Sulfate (SO_4)$^{-2}$	1,000 µg/mL	125 mL	H_2O	AS-SO49-2Y
		500 mL		AS-SO49-2X
Sulfate-Sulfur	1,000 µg/mL	125 mL	H_2O	AS-SO4S9-2Y
		500 mL		AS-SO4S9-2X

Cations	Concentration	Volume	Matrix	Part #
Ammonium (NH_4^+)	1,000 µg/mL	125 mL	H_2O	CS-NH49-2Y
Calcium (Ca^{2+})	1,000 µg/mL	125 mL	0.2% HNO_3	CS-CA2-2Y
Lithium (Li^+)	1,000 µg/mL	125 mL	0.2% HNO_3	CS-LI2-2Y
Magnesium (Mg^{2+})	1,000 µg/mL	125 mL	0.2% HNO_3	CS-MG2-2Y
Potassium (K^+)	1,000 µg/mL	125 mL	0.2% HNO_3	CS-K2-2Y
Sodium (Na^+)	1,000 µg/mL	125 mL	0.2% HNO_3	CS-NA2-2Y

Ion Selective Electrodes	Concentration	Volume	Matrix	Part #
Bromide (Br^-)	1,000 µg/mL	125 mL	H_2O	AS-BR9-2Y
	1,000 µg/mL	500 mL		AS-BR9-2X
	0.1 M	125 mL		AS-BR9-5Y
	0.1 M	500 mL		AS-BR9-5X
Chloride (Cl^-)	100 µg/mL	125 mL	H_2O	AS-CL9-1Y
	100 µg/mL	500 mL		AS-CL9-1X
	1,000 µg/mL	125 mL		AS-CL9-2Y
	1,000 µg/mL	500 mL		AS-CL9-2X
	0.1 M	125 mL		AS-CL9-5Y
	0.1 M	500 mL		AS-CL9-5X
Fluoride (F^-)	10 µg/mL	125 mL	H_2O	AS-F9-1AY
	10 µg/mL	500 mL		AS-F9-1AX
	100 µg/mL	125 mL		AS-F9-1Y
	100 µg/mL	500 mL		AS-F9-1X
	1,000 µg/mL	125 mL		AS-F9-2Y
	1,000 µg/mL	500 mL		AS-F9-2X
	0.1 M	125 mL		AS-F9-5Y
	0.1 M	500 mL		AS-F9-5X
Cyanide (CN^-)	1,000 µg/mL	125 mL	2% KOH	RSCN9-2Y
	1,000 µg/mL	500 mL		RSCN9-2X

Buffers	Concentration	Volume	Matrix	Part #
5M Sodium Nitrate ($NaNO_3$) Buffer	5 M	500 mL	H_2O	IS-BUF1-500
10M Sodium Hydroxide (NaOH) Buffer	10 M	500 mL	H_2O	IS-BUF2-500
Low Level TISAB II Buffer	-	500 mL	H_2O	IS-BUF3-500

Elements	Concentration	Volume	Matrix	Part #
F^-	20 µg/mL	125 mL	H_2O	ICMIX1-100
CL^-	30 µg/mL			
NO_3^-	100 µg/mL			
HPO_4^{-2}, SO_4^{-2}	150 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
F^-	100 µg/mL	125 mL	H_2O	ICMIX2-100
Cl^-	200 µg/mL			
Br-, NO_3-, SO_4^{-2}	400 µg/mL			
HPO_4^{-2}	600 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
F^-	20 µg/mL	125 mL	H_2O	ICMIX6-100
NO_3^- as N, NO_2^- as N	25 µg/mL			
Cl^-	50 µg/mL			
Br^-	100 µg/mL			
HPO_4^{-2}, SO_4^{-2}	150 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
Li^+	50 µg/mL	125 mL	2% HNO_3	ICMIX3-100
K^+, Mg^{+2}, NA^+	200 µg/mL			
NH_4^+	400 µg/mL			
Ca^{+2}	1,000 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
Li^+	10 µg/mL	125 mL	0.5% HNO_3	ICMIX4-100
Na^+	50 µg/mL			
K+, NH_4^+	100 µg/mL			

Elements	Concentration	Volume	Matrix	Part #
Mg^{2+}	200 µg/mL	125 mL	2% HNO_3	ICMIX5-100
Ca^{2+}	400 µg/mL			
Sr^{2+}	600 µg/mL			
Ba^{2+}	1,600 µg/mL			

Eluents are made from high purity salts and filtered ASTM Type I Water. All eluents are at 100-fold concentration and ready for dilution, as needed, with filtered ASTM Type I Water.

Description	Concentration	Volume	Matrix	Part #
0.5 M Sodium Carbonate (Na_2CO_3) Eluent Concentrate	0.5 M	125 mL	H_2O	IC-ELCON1-100
0.5 M Sodium Bicarbonate ($NaHCO_3$) Eluent Concentrate	0.5 M	125 mL	H_2O	IC-ELCON2-100
0.18 M Sodium Carbonate (Na_2CO_3)	0.18 M	125 mL	H_2O	IC-ELCON3-100
0.17 M $NaHCO_3$ Sodium Bicarbonate Concentrate	0.17 M			
ASTM Type I Water, 18 Megaohm	-	500 mL	H_2O	PLBLK-H2O
ASTM Type I Water, 18 Megaohm	-	1 L	H_2O	PLBLK-H2O-1L
ASTM Type I Water, 18 Megaohm	-	2 L	H_2O	PLBLK-H2O-2L
ASTM Type I Water, 18 Megaohm	-	4 L	H_2O	PLBLK-H2O-4L

Contents	Part #
AS-BR9-5Y	AS-BR9-SET
AS-BR9-2Y	
IS-BUF1-500	

Contents	Part #
RSCN9-2Y	RSCN9-SET
IS-BUF2-500	

Contents	Part #
AS-F9-5Y	AS-F9-SET
AS-F9-1AY	
AS-F9-1Y	
AS-F9-2Y	
IS-BUF3-500	

Cyanide Reference Standard in a simple form designed for US EPA Methods 335.2 and 335.3, ASTM Method D2036-19, and Standard Method 4500-CNF, and in a complex form for use with US EPA Method 335.1.

Description	Element	Concentration	Volume	Matrix	Part #
Cyanide, Simple	CN^-	1,000 µg/mL	125 mL	2% KOH	RSCN9-2Y
Cyanide, Simple	CN^-	1,000 µg/mL	500 mL	2% KOH	RSCN9-2X
Cyanide, Complex	CN^-	1,000 µg/mL	500 mL	2% KOH	RSCN9C-2X

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section 9

Our sodium thiosulfate solutions are prepared from ACS Grade, micro-crystalline $Na_2S_2O_3$. In order to maximize shelf life, our matrix is prepared using double-deionized, ASTM Type I Water.

Our iodine solutions are prepared from ACS Grade potassium iodide and crystalline elemental iodine. To guarantee a clean and stable product, our matrix is prepared using double-deionized, ASTM Type I Water.

All solutions are prepared gravimetrically using high accuracy analytical balances to ensure precise target concentrations. Each batch is thoroughly homogenized using a high speed industrial mixer to ensure reliable results from the first bottle to the last.

We are titrating our samples on our automated titrator. The automated dosing drive uses 10,000 steps over a 20 mL volume, so its dosing increment *can be* as small as 2 µL. For these applications, we are using a minimum dose of 10 µL for the sodium thiosulfate endpoint and 4 µL for the iodine endpoint. These settings achieve the extremely precise measurements for each titration while also staying within the parameters of the dosing unit.

As stated on our Certificate of Analysis, the sodium thiosulfate is run against a 0.1 N potassium dichromate solution. The exact normality of this solution is calculated by comparing it to NIST potassium dichromate. A set of 6 samples are run that must all be within the nominal value of 0.0394 N ± 0.00008 N.

The certified sodium thiosulfate is then used to titrate iodine. A set of 3 samples are run that must all be within the nominal value of 0.0473 N ± 0.00003 N.

Before releasing either of these reagents for packaging, we run QC checks with a previous lot to ensure accuracy over time.

Description	Packaging	Volume	Matrix	Part #
0.0394 N Sodium Thiosulfate	Cubitainer	1 Gallon	H_2O/0.5% Amyl Alcohol	182002
0.0473 N Iodine	Amber Glass Bottle	1 Gallon	H_2O	183134

Contact or 732.549.7144 today to request a free sample for method validation.

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section 10

The new guidelines set by the United States Pharmacopeia (USP) and the International Conference on Harmonization (ICH) have pushed the pharmaceutical and nutraceutical industries to provide accurate, quantifiable results for metal analysis in drugs, pharmaceutical substances and raw materials.

USP <232> outlines new limits in pharmaceutical products for arsenic, cadmium, lead, and mercury. The procedures focus on the use of ICP-MS for the analysis of low level impurities. ICP-MS instrumentation, along with accurate ICP-MS standards, allow for increased efficiency and accuracy of the analysis necessary to comply with the new regulations. In addition to the changes enacted by the USP.

Developed in accordance with USP <232> Elemental Impurities, Spex CertiPrep offers these additions to our Consumer Safety Compliance Standards line. These standards can be used as a calibration or check standard to verify Oral Daily Dose PDE, Parenteral Component Limit or Parenteral Daily Dose PDE as well as Inhalation Component Limit or Daily Dose. Our extensive experience in creating quality trace metal standards, coupled with your ICP-MS analysis, will ensure your company will remain compliant with the new and changing regulations.

Elements	Concentration	Volume	Matrix	Part #
Co	50 mg/kg	125 mL	2% HNO_3	USP-ORAL2A
V	100 mg/kg			
Ni	200 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Tl	8 mg/kg	125 mL	2% HNO_3	USP-ORAL2B-1
Ag	150 mg/kg			
Se	150 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Au, Ir, Os, Pd, Pt, Rh, Ru	100 mg/kg for each component	125 mL	15% HCl	USP-ORAL2B-2

Elements	Concentration	Volume	Matrix	Part #
Li	550 mg/kg	125 mL	10% HNO_3	USP-ORAL3-1
Ba	1,400 mg/kg			
Cu	3,000 mg/kg			
Cr	11,000 mg/kg			

Element	Concentration	Volume	Matrix	Part #
Sb	1,200 mg/kg	125 mL	5% HNO_3/tr. Tartaric Acid/tr. HF	USP-ORAL3-2
Mo	3,000 mg/kg			
Sn	6,000 mg/kg			

Element	Concentration	Volume	Matrix	Part #
Co	5 mg/kg	125 mL	2% HNO_3	USP-PARENT2A
V	10 mg/kg			
Ni	20 mg/kg			

Element	Concentration	Volume	Matrix	Part #
Tl	8 mg/kg	125 mL	2% HNO_3	USP-PARENT2B-1
Ag	10 mg/kg			
Se	80 mg/kg			

Element	Concentration	Volume	Matrix	Part #
Ir	10 mg/kg	125 mL	10% HCl	USP-PARENT2B-2
Os	10 mg/kg			
Pd	10 mg/kg			
Pt	10 mg/kg			
Rh	10 mg/kg			
Ru	10 mg/kg			
Au	100 mg/kg			

Element	Concentration	Volume	Matrix	Part #
Sb	90 mg/kg	125 mL	5% HNO_3/tr. Tartaric Acid/tr. HF	USP-PARENT3
Li	250 mg/kg			
Cu	300 mg/kg			
Sn	600 mg/kg			
Ba	700 mg/kg			
Cr	1,100 mg/kg			
Mo	1,500 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Hg	1 mg/kg	125 mL	5% HNO_3	USP-INHL1
As, Cd	2 mg/kg			
Pb	5 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
V	1 mg/kg	125 mL	2% HNO_3	USP-INHL2A
Co	3 mg/kg			
Ni	5 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Ag	7 mg/kg	125 mL	2% HNO_3	USP-INHL2B-1
Tl	8 mg/kg			
Se	130 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Gold	1 mg/kg for each component	125 mL	5% HCl	USP-INHL2B-2
Iridium				
Osmium				
Palladium				
Platinum				
Rhodium				
Ruthenium				

Elements	Concentration	Volume	Matrix	Part #
Cr	3 mg/kg	125 mL	2% HNO_3/tr. Tartaric Acid/tr. HF	USP-INHL3
Mo	10 mg/kg			
Sb	20 mg/kg			
Li	25 mg/kg			
Cu	30 mg/kg			
Sn	60 mg/kg			
Ba	300 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
As	1.5 mg/kg	125 mL	5% HNO_3	USP-TXM2
Pb	5 mg/kg			
Hg	15 mg/kg			
Cd	25 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Cd	5 mg/kg	125 mL	5% HNO_3 /1% HCl	USP-TXM2A
Pb	5 mg/kg			
As	15 mg/kg			
Hg	30 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Cd	5 mg/kg	125 mL	5% HNO_3 /1% HCl	USP-TXM2A
Pb	5 mg/kg			
As	15 mg/kg			
Hg	30 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Ir, Os, Pd, Pt, Rh, Ru	100 mg/kg for each component	125 mL	15% HCl	USP-TXM3

Elements	Concentration	Volume	Matrix	Part #
Ir, Pd, Pt, Rh, Ru	100 mg/kg for each component	125 mL	15% HCl	USP-TXM4

Elements	Concentration	Volume	Matrix	Part #
Mo	100 mg/kg	125 mL	5% HNO_3	USP-TXM5
V	100 mg/kg			
Ni	500 mg/kg			
Cu	1,000 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
V	100 mg/kg	125 mL	5% HNO_3	USP-TXM5A
Ni	200 mg/kg			
Cu	3,000 mg/kg			
Mo	3,000 mg/kg			
Cr	11,000 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
V	10 mg/kg	125 mL	5% HNO_3	USP-TXM5B
Ni	20 mg/kg			
Cu	300 mg/kg			
Cr	1,100 mg/kg			
Mo	1,500 mg/kg			

Elements	Concentration	Volume	Matrix	Part #
Cd	2 mg/kg	125 mL	5% HNO_3/1% HCl	USP-TXM6A
Hg	3 mg/kg			
Pb	5 mg/kg			
As	15 mg/kg			

Element	Concentration	Volume	Matrix	Part #
As	1.5 mg/kg	125 mL	5% HNO_3	ICH-TXM2
Pb	5 mg/kg			
Hg	15 mg/kg			
Cd	25 mg/kg			

Element	Concentration	Volume	Matrix	Part #
Ir, Os, Pd, Pt, Rh, Ru	100 mg/kg	125 mL	15% HCl	ICH-TXM3

Element	Concentration	Volume	Matrix	Part #
Ir, Pd, Pt, Rh, Ru	100 mg/kg	125 mL	15% HCl	ICH-TXM4

Element	Concentration	Volume	Matrix	Part #
Co, Mo, V	100 mg/kg	125 mL	5% HNO_3	ICH-TXM7
Cr, Ni	250 mg/kg			
Cu	1,000 mg/kg			
Mn	2,500 mg/kg			

Element	Concentration	Volume	Matrix	Part #
Fe, Zn	13,000 mg/kg	125 mL	5% HNO_3	ICH-TXM8

We will guarantee your custom standards for one year from the date of shipment and supply your standard with a Comprehensive Certificate of Analysis. With our aqueous standards, you may choose between our conventional ICP certification, or request Claritas PPT® certifications, which includes an impurities analysis of up to 68 elements to ppt levels measured on ICP-MS.

To get started, contact our technical support team or visit with the following information:

- Your specific application/instrumentation
- The elements or complexes you desire
- The concentration(s) at which you require each component
- The matrix which you prefer (e.g., water, dilute acid, oil, methanol, etc.)

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section 11

ISO 17034 Certified

Description	Concentration	Matrix	Part #
pH 2.00 Buffer	2 SI Units	H_2O	PH-BUFF2-500
pH 3.00 Buffer	3 SI Units	H_2O	PH-BUFF3-500
pH 4.00 Buffer	4 SI Units	H_2O	PH-BUFF4-500
pH 5.00 Buffer	5 SI Units	H_2O	PH-BUFF5-500
pH 6.00 Buffer	6 SI Units	H_2O	PH-BUFF6-500
pH 7.00 Buffer	7 SI Units	H_2O	PH-BUFF7-500
pH 8.00 Buffer	8 SI Units	H_2O	PH-BUFF8-500
pH 9.00 Buffer	9 SI Units	H_2O	PH-BUFF9-500
pH 10.00 Buffer	10 SI Units	H_2O	PH-BUFF10-500
pH 11.00 Buffer	11 SI Units	H_2O	PH-BUFF11-500
pH 12.00 Buffer	12 SI Units	H_2O	PH-BUFF12-500

Description	Element	Concentration	Volume	Matrix	Part #
100 µmhos/cm @ 25°C	65 µg/mL as KCL	100 µmhos	500 mL	H_2O	TDS-1-500
1,000 µmhos/cm @ 25°C	650 µg/mL as KCL	1,000 µmhos	500 mL	H_2O	TDS-2-500

** This is for general informational purposes only. These are uncertified values and do not pertain to any specific lot of product. **

		TEMPERATURE (°C)									
Part #	pH Buffer	0	5	10	15	20	25	30	35	40	50
PH-BUFF2-500	pH 2	1.97	1.98	1.98	2.02	2.00	2.00	2.00	2.02	2.01	2.02
PH-BUFF3-500	pH 3	2.97	2.98	2.97	3.00	3.00	3.00	3.02	3.03	3.03	3.06
PH-BUFF4-500	pH 4	4.01	3.99	4.00	4.00	4.00	4.00	4.01	4.02	4.03	4.06
PH-BUFF5-500	pH 5	5.05	5.04	5.03	5.00	5.00	5.00	5.01	5.01	5.04	5.07
PH-BUFF6-500	pH 6	6.07	6.05	6.06	6.05	6.00	6.00	5.99	5.98	5.97	5.96
PH-BUFF7-500	pH 7	7.13	7.10	7.07	7.05	7.02	7.00	6.99	6.98	6.97	6.83
PH-BUFF8-500	pH 8	8.15	8.13	8.08	8.01	8.00	8.00	8.00	7.95	7.94	7.93
PH-BUFF9-500	pH 9	9.17	9.13	9.09	9.06	9.02	9.00	8.97	8.93	8.91	8.87
PH-BUFF10-500	pH 10	10.34	10.26	10.19	10.12	10.06	10.00	9.94	9.90	9.85	9.77
PH-BUFF11-500	pH 11	11.80	11.69	11.46	11.31	11.17	11.00	10.88	10.76	10.62	10.37
PH-BUFF12-500	pH 12	12.02	12.03	12.04	12.01	12.00	12.00	12.02	12.02	12.06	12.10

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section 12

Organometallic Oil Standards

The determination of wear metals in engine oils and other lubricants can be applied to machines such as automobiles, aircraft, heavy equipment, trucks, locomotives, military vehicles, etc. The examples are endless.

By tracking metals suspended in the used oil, engineers, designers and mechanics can determine the breakdown of specific engine parts. Specific elements present in used oils have been found to be directly related to specific engine problems. Engine failures, as well as expensive repairs, can be avoided if engine oils are analyzed, providing a periodic trend to predict maintenance or replacement.

Spex CertiPrep presents a comprehensive offering of Organometallic Oil Standards. The benefits and advantages of these standards are many:

- Choice of over 35 single-elements at 1,000 or 5,000 µg/g
- Popular multi-element blends of 23, 21, 12, or 5 elements
- Clear, transparent matrix
- 1 year expiration date
- Convenient sizes: 50 or 100 grams
- Certificate of Analysis with every solution
- Guaranteed stable and accurate
- Manufactured under an internationally accredited ISO 9001 quality system and compliant with ISO/IEC 17025
- Custom standards available

- Wear metals
- Crude oils
- Additive metals
- Environmental monitoring
- Petrochemical testing
- Pharmaceuticals
- Food processing
- Sulfur in diesel fuel

Each standard is supplied with a Certificate of Analysis and is packaged in a 50 gram bottle.

Elements in Base Oil	Concentration	Weight	Matrix	Part #
Aluminum (Al)	1,000 µg/g	50 g	Base Oil 20	ORG-AL8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-AL8-4Z
Antimony (Sb)	1,000 µg/g	50 g	Base Oil 20	ORG-SB8-2Z
Arsenic (As)	1,000 µg/g	50 g	Base Oil 75	ORG-AS8-2Z
Barium (Ba)	1,000 µg/g	50 g	Base Oil 75	ORG-BA8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-BA8-4Z
Beryllium (Be)	1,000 µg/g	50 g	Base Oil 75	ORG-BE8-2Z
Bismuth (Bi)	1,000 µg/g	50 g	Base Oil 75	ORG-BI8-2Z
Boron (B)	1,000 µg/g	50 g	Base Oil 75	ORG-B8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-B8-4Z
Cadmium (Cd)	1,000 µg/g	50 g	Base Oil 75	ORG-CD8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-CD8-4Z
Calcium (Ca)	1,000 µg/g	50 g	Base Oil 75	ORG-CA8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-CA8-4Z
Chromium (Cr)	1,000 µg/g	50 g	Base Oil 75	ORG-CR8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-CR8-4Z
Cobalt (Co)	1,000 µg/g	50 g	Base Oil 75	ORG-CO8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-CO8-4Z
Copper (Cu)	1,000 µg/g	50 g	Base Oil 75	ORG-CU8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-CU8-4Z
Iron (Fe)	1,000 µg/g	50 g	Base Oil 75	ORG-FE8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-FE8-4Z
Lead (Pb)	1,000 µg/g	50 g	Base Oil 75	ORG-PB8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-PB8-4Z
Lithium (Li)	1,000 µg/g	50 g	Base Oil 20	ORG-LI8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-LI8-4Z
Magnesium (Mg)	1,000 µg/g	50 g	Base Oil 75	ORG-MG8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-MG8-4Z
Manganese (Mn)	1,000 µg/g	50 g	Base Oil 75	ORG-MN8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-MN8-4Z
Mercury (Hg)	1,000 µg/g	50 g	Base Oil 75	ORG-HG8-2Z
Molybdenum (Mo)	1,000 µg/g	50 g	Base Oil 75	ORG-MO8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-MO8-4Z
Nickel (Ni)	1,000 µg/g	50 g	Base Oil 75	ORG-NI8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-NI8-4Z
Phosphorus (P)	1,000 µg/g	50 g	Base Oil 75	ORG-P8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-P8-4Z
Potassium (K)	1,000 µg/g	50 g	Base Oil 75	ORG-K8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-K8-4Z
Scandium (Sc)	1,000 µg/g	50 g	Base Oil 75	ORG-SC8-2Z
Selenium (Se)	1,000 µg/g	50 g	Base Oil 75	ORG-SE8-2Z

Elements in Base Oil	Concentration	Weight	Matrix	Part #
Silicon (Si)	1,000 µg/g	50 g	Base Oil 20	ORG-SI8-2Z
Silver (Ag)	1,000 µg/g	50 g	Base Oil 75	ORG-AG8-2Z
Sodium (Na)	1,000 µg/g	50 g	Base Oil 20	ORG-NA8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-NA8-4Z
Sulfur (S)	1,000 µg/g	50 g	Base Oil 75	ORG-S8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-S8-4Z
Thallium (Tl)	1,000 µg/g	50 g	Base Oil 20	ORG-TL8-2Z
Tin (Sn)	1,000 µg/g	50 g	Base Oil 20	ORG-SN8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-SN8-4Z
Titanium (Ti)	1,000 µg/g	50 g	Base Oil 20	ORG-TI8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-TI8-4Z
Vanadium (V)	1,000 µg/g	50 g	Base Oil 75	ORG-V8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-V8-4Z
Yttrium (Y)	1,000 µg/g	50 g	Base Oil 75	ORG-Y8-A-2Z
Zinc (Zn)	1,000 µg/g	50 g	Base Oil 20	ORG-ZN8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-ZN8-4Z
Zirconium (Zr)	1,000 µg/g	50 g	Base Oil 20	ORG-ZR8-2Z
	5,000 µg/g	50 g	Base Oil 75	ORG-ZR8-4Z

Elements in Base Oil	Concentration	Weight	Matrix	Part #
Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Si, Sn, Ti, V, Zn	100 µg/g	50 g	Base Oil 75	S23-100Z
	100 µg/g	100 g		S23-100Y
	300 µg/g	50 g		S23-300Z
	300 µg/g	100 g		S23-300Y
	500 µg/g	50 g		S23-500Z
	500 µg/g	100 g		S23-500Y
	900 µg/g	50 g		S23-900Z
	900 µg/g	100 g		S23-900Y

Elements in Base Oil	Concentration	Weight	Matrix	Part #
Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn	100 µg/g	50 g	Base Oil 75	S21-100Z
	100 µg/g	100 g		S21-100Y
	300 µg/g	50 g		S21-300Z
	300 µg/g	100 g		S21-300Y
	500 µg/g	50 g		S21-500Z
	500 µg/g	100 g		S21-500Y
	900 µg/g	50 g		S21-900Z
	900 µg/g	100 g		S21-900Y

Elements in Base Oil	Concentration	Weight	Matrix	Part #
Ag, Al, Cr, Cu, Fe, Mg, Na, Ni, Pb, Si, Sn, Ti	100 µg/g	50 g	Base Oil 75	S12-100Z
	100 µg/g	100 g		S12-100Y
	500 µg/g	50 g		S12-500Z
	900 µg/g	50 g		S12-900Z
	900 µg/g	100 g		S12-900Y

Elements in Base Oil	Concentration	Weight	Matrix	Part #
Ba, Ca, Mg, P, Zn	900 µg/g	50 g	Base Oil 75	AM-900Z
	900 µg/g	100 g		AM-900Y
	1,000 µg/g	50 g		AM-1000Z
	1,000 µg/g	100 g		AM-1000Y
	5,000 µg/g	50 g		AM-5000Z
	5,000 µg/g	100 g		AM-5000Y

Base Oil 20 and 75 are the same certified base oils that are used in our singles and multi-element blends.

Matrix	Part #
Base Oil 20	BASE20

Matrix	Part #
Base Oil 20	BASE20-G

Matrix	Part #
Base Oil 75	BASE75

Matrix	Part #
Base Oil 75	BASE75-G

Matrix	Part #
Kerosene	KER-BLK

Matrix	Part #
Kerosene	KER-BLK-G

Organometallic Oil Standards

Governments worldwide have passed regulations that mandate lower levels of sulfur in biodiesel fuel. To comply with the implementation of these regulations, Spex CertiPrep offers specifically designed Certified Reference Materials for industrial use. Our B100 Biodiesel Standards meet the requirements for testing ASTM Methods D6751, D5453 and EN 14214.

Description	Concentration	Volume	Matrix	Part #
Certified Matrix Blank	N/A	100 mL	B100	BF-BLKY
Certified Matrix Blank	N/A	500 mL	B100	BF-BLKX
Sulfur	5 µg/g	100 mL	B100	BFS-5Y
Sulfur	10 µg/g	100 mL	B100	BFS-10Y
Sulfur	15 µg/g	100 mL	B100	BFS-15Y
Sulfur	20 µg/g	100 mL	B100	BFS-20Y
Sulfur	25 µg/g	100 mL	B100	BFS-25Y
Sulfur	50 µg/g	100 mL	B100	BFS-50Y
Sulfur	100 µg/g	100 mL	B100	BFS-100Y
Ca, K, Mg, Na, P	5 µg/g	100 mL	B100	BFM-5Y
Ca, K, Mg, Na, P	10 µg/g	100 mL	B100	BFM-10Y
Ca, K, Mg, Na, P	20 µg/g	100 mL	B100	BFM-20Y

Description	Concentration	Volume	Matrix	Part #
Sulfur Blank	0 µg/g	100 mL	Base Oil 20	DSS8-Y
Sulfur	5 µg/g	100 mL	Base Oil 20	DSS8-5Y
Sulfur	10 µg/g	100 mL	Base Oil 20	DSS8-10Y
Sulfur	15 µg/g	100 mL	Base Oil 20	DSS8-15Y
Sulfur	20 µg/g	100 mL	Base Oil 20	DSS8-20Y
Sulfur	25 µg/g	100 mL	Base Oil 20	DSS8-25Y
Sulfur	50 µg/g	100 mL	Base Oil 20	DSS8-AY
Sulfur	75 µg/g	100 mL	Base Oil 20	DSS8-75Y
Sulfur	100 µg/g	100 mL	Base Oil 20	DSS8-1Y
Sulfur	200 µg/g	100 mL	Base Oil 20	DSS8-BY
Sulfur	300 µg/g	100 mL	Base Oil 20	DSS8-CY
Sulfur	500 µg/g	100 mL	Base Oil 20	DSS8-1AY
Sulfur	750 µg/g	100 mL	Base Oil 20	DSS8-1BY
Sulfur	1,000 µg/g	100 mL	Base Oil 20	DSS8-2Y

Contents	Part #
DSS8-1AY	DSS8-SET
DSS8-1BY	
DSS8-1Y	
DSS8-2Y	
DSS8-AY	
DSS8-BY	
DSS8-CY	
BASE20	

Contents	Part #
SDFS-10-Y	SDFS-SET
SDFS-100-Y	
SDFS-15-Y	
SDFS-20-Y	
SDFS-25-Y	
SDFS-5-Y	
SDFS-50-Y	
SDFS-BLK-Y	

Description	Concentration	Volume	Matrix	Part #
Sulfur Blank	0 µg/g	100 mL	#2 Diesel Fuel	SDFS-BLK-Y
Sulfur	5 µg/g	100 mL	#2 Diesel Fuel	SDFS-5-Y
Sulfur	10 µg/g	100 mL	#2 Diesel Fuel	SDFS-10-Y
Sulfur	15 µg/g	100 mL	#2 Diesel Fuel	SDFS-15-Y
Sulfur	20 µg/g	100 mL	#2 Diesel Fuel	SDFS-20-Y
Sulfur	25 µg/g	100 mL	#2 Diesel Fuel	SDFS-25-Y
Sulfur	50 µg/g	100 mL	#2 Diesel Fuel	SDFS-50-Y
Sulfur	75 µg/g	100 mL	#2 Diesel Fuel	SDFS-75-Y
Sulfur	100 µg/g	100 mL	#2 Diesel Fuel	SDFS-100-Y
Sulfur	200 µg/g	100 mL	#2 Diesel Fuel	SDFS-200-Y
Sulfur	300 µg/g	100 mL	#2 Diesel Fuel	SDFS-300-Y
Sulfur	400 µg/g	100 mL	#2 Diesel Fuel	SDFS-400-Y
Sulfur	500 µg/g	100 mL	#2 Diesel Fuel	SDFS-500-Y
Sulfur	750 µg/g	100 mL	#2 Diesel Fuel	SDFS-750-Y
Sulfur	1,000 µg/g	100 mL	#2 Diesel Fuel	SDFS-1000-Y

Collectively our employees speak 15 different languages!
Languages include: English, French, Russian, Spanish, Mandarin, Japanese, Portuguese, Hindi, Chinese, Sindhi, Hebrew, Gujarati, Indonesian, Punjabi, and German.

HCS PICTOGRAMS & HAZARDS

As of June 1, 2015, OSHA's Hazard Communication Standard (HCS) will require pictograms on labels to alert users of the chemical hazards to which they may be exposed. The HCS is designed to meet the requirements of the Globally Harmonized System (GHS).

- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

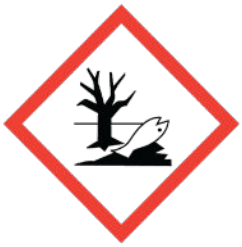
- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non-Mandatory)

- Gases Under Pressure

- Skin Corrosion / Burns
- Eye Damage
- Corrosive to Metals

- Explosives
- Self-Reactives
- Organic Peroxides

- Oxidizers



- Aquatic Toxicity

- Acute Toxicity (fatal or toxic)

spex® certiprep

section 13

Fusion Fluxes & Additives

Fusion is a technique used to prepare Inorganic samples, with a view to analyze them by X-Ray Fluorescence (XRF), Inductively Coupled Plasma (ICP), Atomic Absorption (AA), or any traditional wet chemistry method. Typical samples include: cements, ores, slag, sediments, soils, rocks, ceramics, pigments, glasses and even metals. A fusion can produce either a small, homogeneous glass disk (or "bead") for XRF, or an acid solution for other analytical methods. Fusion is an extremely effective method of preparation for oxides, sulfides, fluorides, ferroalloys, and other compounds for analysis by XRF, AA, ICP, DCP, etc. The samples are, if necessary, pulverized and mixed with a flux; this mixture is heated until the flux melts and the sample dissolves in it, yielding a clear, homogeneous melt. The melt can be cast as a glass disk for XRF or dissolved in dilute acids for analysis in solution form. In many cases, fusion fluxing is simpler and the analytical results more accurate than if the sample was prepared by conventional acid dissolution or pressed powder methods.

Spex CertiPrep has a line of pure and ultra-pure Fusion Fluxes and Additives. Both lines are of a high purity, with the ultra pure line having a purity of 99.998%. These fluxes are made from a "micro bead" formula that ensures the same ratio of components is in each bead with no harmful dust to clog your instruments. Our highly standardized manufacturing process produces identical batches with no appreciable lot-to-lot variations, thus maintaining a high level of consistency and quality.

Features of our Fluxes:

- **Homogeneity** - Each flux has the same composition throughout. If a flux is not homogeneous, segregation will affect the XRF intensities.
- **Purity** - With pure fluxes, no element impurity exceeds 10 µg/mL. With ultra pure fusion flux, impurities are practically non-existent.
- **High Density** - Our fluxes have a density of 1.4 as compared to 0.3 for fine fluxes. High density flux is easier to handle, measure and, with certain applications, smaller, less expensive platinum ware can be used.
- **Not Hydroscopic** - All of our fluxes have a water content of < 0.05%. The major disadvantage of absorbed water is a loss of accuracy, in the analytical result. This is due to an error in the sample/flux ratio; additionally, the volatilization of water can sometimes occur suddenly, blowing a fraction of the flux sample out of the crucible.
- **Granularity** - All of our fluxes have a granularity greater than 500 µm which means that they contain no dust. Due to electrostatic forces, dusty flux sticks to the weighing pan, the funnel, and the crucible wall, resulting in a loss of flux and the formation of glass droplets on the wall of the crucible.
- **Outstanding Fluidity** - Granular flux will not stick to surfaces and will leave the crucible wall clean after fusion.

Spex SamplePrep offers two approaches to fusion fluxing: the Spex SamplePrep Automated Fluxer for rapid, repetitive fusions, and graphite crucibles for smaller scale operation.

Spex SamplePrep Graphite Crucibles

Spex SamplePrep graphite crucibles are a cost effective alternative to metal (platinum/gold) crucibles used to contain samples during fusion. Graphite crucibles are disposable, eliminating both the need for time consuming cleaning and the possibility for sample cross contamination. Chemically inert and heat resistant, graphite will not combine with samples during fusion.

Description	Weight	Part #
Lithium Metaborate (100%)	1 kg	FFB-0000-02
Lithium Tetraborate (100%)]	1 kg	FFB-1000-02
Lithium Tetraborate (99.5%) | Lithium Bromide (0.50%)	1 kg	FFB-1005-02
Lithium Tetraborate (67%) | Lithium Metaborate (33%)	1 kg	FFB-6700-02
Lithium Tetraborate (65.75%) | Lithium Metaborate (33.75%) | Lithium Bromide (0.50%)	1 kg	FFB-6705-02
Lithium Tetraborate (50%) | Lithium Metaborate (50%)	1 kg	FFB-5000-02
Lithium Tetraborate (49.75%) | Lithium Metaborate (49.75%) | Lithium Bromide (0.50%)	1 kg	FFB-5005-02
Lithium Tetraborate (49.75%) | Lithium Metaborate (49.75%) | Lithium Iodide (0.50%)	1 kg	FFB-5007-02
Lithium Tetraborate (49.50%) | Lithium Metaborate (49.50)| Lithium Bromide (1.00%)	1 kg	FFB-5010-02
Lithium Tetraborate (34.83%) | Lithium Metaborate (64.67%) | Lithium Bromide (0.50%)	1 kg	FFB-3505-02

Description	Weight	Part #
Lithium Metaborate (100%)	1 kg	FFB-0000-03
Lithium Metaborate (99.5%) | Lithium Bromide (0.50%)	1 kg	FFB-0005-03
Lithium Metaborate (98.50%) | Lithium Bromide (1.50%)	1 kg	FFB-0007-03
Lithium Tetraborate (100%)]	1 kg	FFB-1000-03
Lithium Tetraborate (99.5%) | Lithium Bromide (0.50%)	1 kg	FFB-1005-03
Lithium Tetraborate (99.5%) | lithium Iodide (0.50%)	1 kg	FFB-1007-03
Lithium Tetraborate (50%) | Lithium Metaborate (50%)	1 kg	FFB-5000-03
Lithium Tetraborate (49.75%) | Lithium Metaborate (49.75%) | Lithium Bromide (0.50%)	1 kg	FFB-5005-03
Lithium Tetraborate (49.75%) | Lithium Metaborate (49.75%) | Lithium Iodide (0.50%)	1 kg	FFB-5007-03
Lithium Tetraborate (35%) | Lithium Metaborate (65%)	1 kg	FFB-3500-03

Description	Package Size	Part #
Lithium Bromide Crystals	125 g	FFB-100-03
Lithium Bromide Solution	15 mL	FFB-103-03
Lithium Bromide Solution (10 pack)	10 x 15mL	FFB-105-03
Lithium Carbonate	1 kg	FFB-401-03
Lithium Iodide Crystals	125 g	FFB-110-03
Lithium Iodide Solution (10 pack)	10 x 15 mL	FFB-115-03
Lithium Nitrate Crystals	250 g	FFB-300-03

** Additives do not come with Certificate of Analysis.*

spex® certiprep

section 14

We are the industry leader for over 60 years in the Certified Reference Materials (CRM) marketplace, we continue to meet the needs of laboratories worldwide with innovation and research.

Our contamination control products are designed and Made by Chemists for Chemists® in response to the need for cost effective, easy-to-use equipment, and high purity matrix/wash blanks for the clean laboratory environment.

New, sophisticated instruments which can detect contaminants at parts per trillion (ppt) levels have necessitated the need for eliminating contaminants right at the source. Our dedicated chemists have designed, tested, and approved these products for your use.

Powder in latex gloves used frequently in labs contain high levels of zinc.
Yellow stoppers used for sealing volumetric flasks contain high levels of cadmium.
Dental work containing mercury amalgam fillings can contaminate samples that are directly exposed to exhalation.
Calamine lotion is pure zinc oxide.
Hair dyes contain lead acetate.
Eye makeup contains mercury as a preservative.

Visit to download slides and see a recording of our "*Clean Laboratory Techniques*" presentation.

One major source of contamination is the volumetric pipette. At Spex CertiPrep, our chemists realized that they were spending valuable time manually washing and rinsing pipettes. Conventional washers were expensive and too large to comfortably fit in our laboratory. Our chemists designed a device that could be hooked up to a water line to allow the flow of water or other liquid through the inside and over the outside of the pipettes. As a result, our chemists spent less time cleaning pipettes, and more time manufacturing Spex CertiPrep Certified Reference Materials (CRMs); used and trusted by labs all over the world.

The pipette washer/dryer is easy to use. Simply insert up to 23 pipettes at a time, close the door and attach the tubing to the wash or rinse line. The washer can also be used with the washer basin and pump to circulate wash or rinse solution through the pipettes. The solution shoots out of the pipette tip, reflects off the ceiling portion of the washer and rains a shower down over the outside of the pipettes; thus cleaning both the inside and outside of the pipettes.

To dry the insides of the pipettes, the line is connected to a vacuum source and air is pulled in through the pipette tips until the inside of all of the pipettes are dry.

Product Features:

- Lightweight and compact, the washer/dryer fits within a sink or on a lab bench.
- Durable polyethylene construction.
- Convenient, independent on/off valves control flow to the front and back rows of washers and the main water supply.
- Transparent door closes to prevent splashing when washer is in use.
- 23 cone-shaped, plastic pipette holders accommodate pipettes 0.5-250 mL in size.
- Optional pump and basin available separately.

Technical service available 7:30 AM - 5:30 PM EST. Speak directly with the chemists who developed the washer/dryer.

Demo units available. Please contact us at +1.732.549.7144 or 1.800.LAB.SPEX or via email at
for information and availability.

Description	Specifications	Volts	Hz	Amps	Part #
Pipette Washer/Dryer	3 ft. tall x 1 ft. wide x 1 ft. deep	-	-	-	PIPWASH-1
Pipette Washer Pump	Capacity: 205 Gal/Hr	115 V	60 Hz	1.1 Amps	PIPPUMP-115V
Pipette Washer Pump	Capacity: 205 Gal/Hr	230 V	60 Hz	1.1 Amps	PIPPUMP-230V
Pipette Washer Basin	-	-	-	-	PIPBASIN-1

The 1600 MiniG® is the ideal solution for the labs that want a compact yet powerful tool for QuEChERS sample preparation. The clamp holds up to six 50 mL vials and the vigorous vertical movement is both consistent for every vial and results in improved extraction from samples.

Specifications:

- Safety interlock prevents unit from operating when lid is open. Window allows analyst to view samples during operation.
- Vertical clamp movement ensures thorough extraction. Adjustable clamp holds 6 x 50 mL vials, 24 x 15 mL vials or up to 48 x 2 mL vials.
- Digital timer display with adjustable operating time.
- Compact, powerful motor agitates samples from 500 - 1500 rpm.

Description	Part #
MiniG - Shaker and Tissue Homogenizer	1600
Ceramic Grinding Media - 5/32 in. x 5/16 in.	CP2185
Ceramic Grinding Media 3/8 in. x 7/8 in.	CP2183
Ceramic Grinding Media - 5/16 in. x 5/8 in.	CP2184