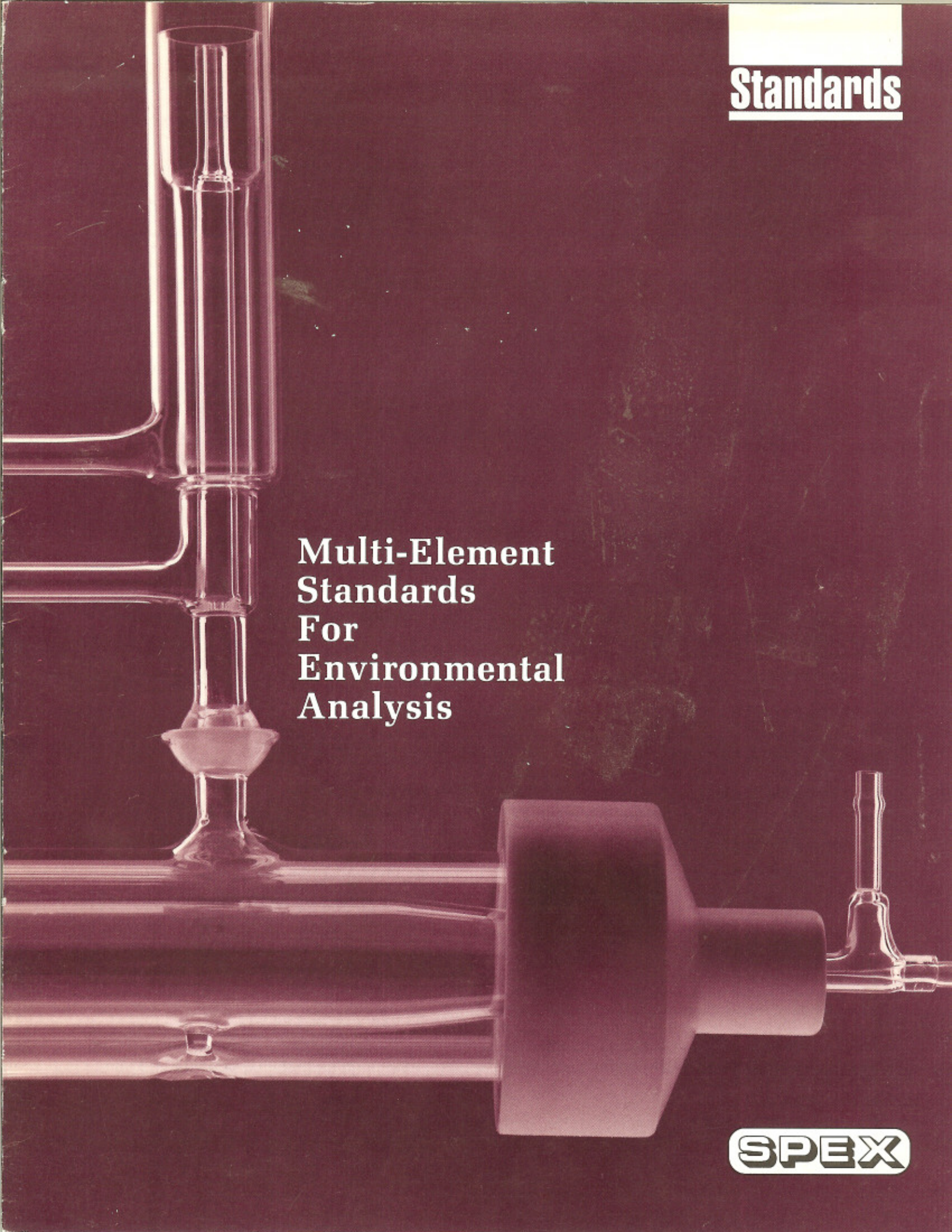
Standards

Multi-Element Standards For Environmental Analysis



SPEX

Multi-Element Standards For Environmental Analysis

- Contract Laboratory Programs, CLP, for Superfund, RCRA
- EPA Test Methods for Evaluating Solid Waste, SW-846
  - Method 6010 for Analysis by ICP and AES
  - Method 1310 for Extracted Metal Pollutants
- Clean Water Act, Method 200.7
- National Primary Drinking Water Regulations

SPEX Industries now offers off-the-shelf, mixed-multi-element standards designed specifically for use in conjunction with the Environmental Protection Agency's published methods for inorganic trace metal analysis.

Each standard is backed up by our unique Triple-Checked Quality Assurance Program, assuring the accuracy and stability of your standards for a shelf life of one full year. Each SPEX Plasma Grade solution is checked three ways:

- DC Arc Trace Metal Analysis of Starting Materials
- Classical Wet Assay of Major Elements
- ICP Check of the Final, Multi-Element Solution

And every SPEX plasma grade standard is supplied with the **SPEX Certificate of Analysis, outlining the analytical methods used, the trace metals found and NBS documentation referenced. No other supplier provides you with this kind of back-up.**

The purity of the starting material is especially important when preparing multi-element standards. For example, a 20-element standard that includes iron is likely to be contaminated with iron from the remaining 19 elements, resulting in significantly higher iron concentrations than the calculated value. All SPEX plasma standards are made from high purity acids, ASTM type I water (18 meg-ohm) and SPEX, certified metals and inorganic compounds. Since we know exactly how much of each element is contributed by each component, a build-up of impurities resulting from undetected contamination in individual starting materials will not occur.

The final ICP check, performed in our own laboratories, is **your stamp of assurance.** We calibrate our instruments with **NBS reference materials** and show you the **actual found value** of the solution you receive, not just an ideal, calculated number.

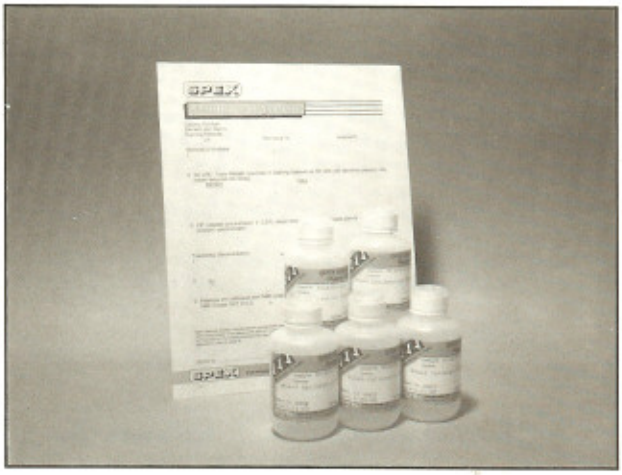
Single-element plasma grade stock solutions are also available from SPEX. The extensive offering of elements, concentrations and matrices can be used to prepare your own multi-element calibration and interference standards for: EPA SW-846, method 6010 section 5.3 and method 200.7 section 7.3.

The sections that follow contain multi-element standards referenced to their specific EPA method or procedure. The combinations of elements, concentrations, and matrices listed have been designed by SPEX for both convenience of use and stability.

Standards may be diluted in the same matrix as that 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 SPEX Matrix Blanks when diluting your standards unless you are certain of the purities of those obtained from another source.

Mixed Multi-Element Calibration Standards

For EPA SW-846, method 6010 section 5.4 and also method 200.7 section 7.4. The following series of five calibration standards are provided for routine instrument calibration. The concentrations and matrices have been selected for both convenience of use and stability. You can also prepare these multi-element standards yourself from individual, SPEX plasma grade single-element solution standards. See the SPEX catalog of Standards and Compounds for Inorganic Analysis for ordering information.



Mixed Calibration Standard 1

#MIXSTD1-100 ..... $65.00
Matrix 2% HNO_3, 100ml

Beryllium .....50 ug/ml
Cadmium .....150 ug/ml
Lead .....500 ug/ml
Manganese .....100 ug/ml
Selenium .....200 ug/ml
Zinc .....150 ug/ml

Mixed Calibration Standard 2

#MIXSTD2-100 ..... $60.00
Matrix 5% HNO_3, 100ml

Barium .....100 ug/ml
Cobalt .....100 ug/ml
Copper .....100 ug/ml
Iron .....10,000 ug/ml
Vanadium .....100 ug/ml

Mixed Calibration Standard 3

#MIXSTD3-100 ..... $45.00
Matrix 2% HNO_3, 100ml

Arsenic .....500 ug/ml
Molybdenum .....100 ug/ml
Silicon .....100 ug/ml

Mixed Calibration Standard 4

#MIXSTD4-100 ..... $65.00
Matrix 5% HNO_3, 100ml

Aluminum .....200 ug/ml
Calcium .....1,000 ug/ml
Chromium .....20 ug/ml
Nickel .....20 ug/ml
Potassium .....400 ug/ml
Sodium .....200 ug/ml

Mixed Calibration Standard 5

#MIXSTD5-100 ..... $60.00
Matrix 5% HNO_3, 100ml

Antimony .....200 ug/ml
Boron .....100 ug/ml
Magnesium .....1,000 ug/ml
Silver .....50 ug/ml
Thallium .....200 ug/ml

Set of 5 Mixed Calibration Standards

#MIXSTD-SET: $250.00
Includes one each of:

MIXSTD1-100
MIXSTD2-100
MIXSTD3-100
MIXSTD4-100
MIXSTD5-100

Calibration Blanks and Matrix Blanks

For use in EPA SW-846, method 6010 section 5.5.1 and also method 200.7 section 7.5.1. All SPEX blank solutions are prepared with the same high purity acids and ASTM type I water as that used in our plasma grade standards. SPEX matrix blanks can be used to dilute your multi-element standards or can be run directly as a blank to establish your base line. The aqua regia blank can be prepared by mixing one part nitric acid blank with five parts hydrochloric acid blank. Do not use any acid or water as a diluent if you are not certain of its purity.

Nitric Acid Blank

#PLBLK-HNO3 .....$25.00
Matrix 5% HNO_3 in ASTM Type I Water, 500ml

Hydrochloric Acid Blank

#PLBLK-HCL $25.00
Matrix 5% HCl in ASTM Type I Water, 500ml

Water Blank

#PLBLK-H2O $25.00
Matrix ASTM Type I Water, 500ml

Instrument Check Standards

For EPA SW-846, Method 6010 section 5.6 and method 200.7 section 7.6.1.

Instrument Check Standards are used to calibrate and verify wavelength accuracy and stability in sequential and simultaneous ICP units.

Each CALMIX is designed to give the user wavelength ranges from 160nm to 790nm. The internal standard (Sc) is added to enhance the color of the ICP plume as well as allow the user to perform internal reference checks or corrections.

Every ICP manufacturer has a specific group of elements at varying concentrations which is used as a guideline to determine instrument accuracy and reliability. Each element is run at a specific wavelength and, depending on the result, an instrument is calibrated and fine-tuned. Some manufacturers have special calibration programs incorporated into their software package; others give you this information in their manuals. Either way, a calibration check should be performed routinely on your unit.

These standards are also useful as training tools for technicians or in methods development. Check your ICP manual or service guide for further information.

Instrument Check Standard 1

#CALMIX1-100 ..... $70.00
Matrix 2% HNO_3, 100ml

Aluminum	10 ug/ml
Barium	1 ug/ml
Beryllium	1 ug/ml
Boron	10 ug/ml
Calcium	1 ug/ml
Nickel	10 ug/ml
Phosphorus	100 ug/ml
Scandium	1 ug/ml
Zinc	10 ug/ml

Instrument Check Standard 2

#CALMIX2-100 ..... $60.00
Matrix 2% HCL, 100ml

Barium	50 ug/ml
Beryllium	20 ug/ml
Lanthanum	20 ug/ml
Manganese	20 ug/ml
Nickel	20 ug/ml
Scandium	20 ug/ml
Zinc	20 ug/ml

Instrument Check Standard 3

#CALMIX3-100 ..... $80.00
Matrix 2% HCL, 100ml

Arsenic	20 ug/ml
Lanthanum	20 ug/ml
Lithium	20 ug/ml
Manganese	20 ug/ml
Molybdenum	20 ug/ml
Nickel	20 ug/ml
Phosphorus	100 ug/ml
Potassium	100 ug/ml
Scandium	20 ug/ml
Sodium	20 ug/ml
Sulfur	100 ug/ml

Instrument Check Standard 4

#CALMIX4-100 ..... $85.00
Matrix 2% HNO_3, 100ml

Aluminum	10 ug/ml
Arsenic	10 ug/ml
Barium	1 ug/ml
Copper	10 ug/ml
Lead	10 ug/ml
Manganese	10 ug/ml
Nickel	10 ug/ml
Phosphorus	10 ug/ml
Potassium	50 ug/ml
Scandium	10 ug/ml
Sodium	10 ug/ml
Zinc	10 ug/ml

Interference Check Standards

For EPA SW-846, method 6010 section 5.7 and method 200.7 section 7.6.2. 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 interelement correction factors are set for simultaneous ICP spectrometer systems.

Interference Check Standard, 18

#INTER18-100 ..... $ 170.00
Matrix 5% HNO_3, 100ml

Arsenic	1,000 ug/ml
Barium	300 ug/ml
Beryllium	100 ug/ml
Cadmium	300 ug/ml
Chromium	300 ug/ml
Cobalt	300 ug/ml
Copper	300 ug/ml
Lead	1,000 ug/ml
Manganese	200 ug/ml
Mercury	50 ug/ml
Nickel	300 ug/ml
Potassium	20,000 ug/ml
Selenium	500 ug/ml
Silver	300 ug/ml
Thallium	1,000 ug/ml
Vanadium	300 ug/ml
Zinc	300 ug/ml

Interference Check Standard, 3

#INTER3-100 ..... $ 65.00
Matrix 5% HNO_3, 100ml

Boron	500 ug/ml
Molybdenum	300 ug/ml
Silicon	230 ug/ml
Titanium	1,000 ug/ml

Interference Check Standard, 1

#INTER1-100 ..... $ 25.00
Matrix 5% HNO_3, 100 ml

Antimony	1000 ug/ml

Interference Check Standard, 5

#INTER5-100 ..... $ 95.00
Matrix 5% HNO_3, 100ml

Aluminum	1,200 ug/ml
Calcium	6,000 ug/ml
Iron	5,000 ug/ml
Magnesium	3,000 ug/ml
Sodium	1,000 ug/ml

Set of 4 Interference Check Standards

INTER-SET ..... $ 295.00
Includes 1 each of:

INTER18-100	INTER3-100
INTER5-100	INTER1-100

Quality Control Standards for EPA SW-846 and Method 200.7

For EPA SW-846, method 6010 section 5.8 and method 200.7 section 7.6.3. The combination of elements and the matrix for the Quality Control Standards are dependent on the types of samples to be analyzed. These standards should be representative of the unknown sample so that matrix effects and other interferences are similar in both.

SPEX Custom Multi-Element Solution Standards are ideally suited to this application. We will be happy to discuss your combination of elements, their concentrations and preferred matrices. We can then customize the most compatible, shelf-stable mixtures from our comprehensive supply of plasma grade metals, oxides and salts in the matrix of your choice. As always, we will guarantee a shelf life of one year from date of manufacture and supply your standard with certified concentration and impurity analysis, all with NBS documentation wherever possible.

Although guidelines for defining a multi-element solution standard may vary depending on the elements involved, the following maximums can be used as a starting point when considering your multi-element standard requirements.

Elemental Concentrations	Maximum Number of Elements
Less than 100 ug/ml each	15
100—1,000 ug/ml each	10
Over 1,000 ug/ml each	5

The elements in your standards need not be present at the same level. In real samples, the need to determine the presence of trace elements with a high background level of some major component often arises. Standards are ordered initially by describing the elements required, their levels and your preferred matrix. We will then review the composition requested for inter-elemental compatibility, solubility and matrix requirements. You will be given a unique part number which corresponds to your particular standard and a firm price quotation.

The following pricing structure can be used as a guideline for the calculation of the approximate price of a multi-element blend. Some elements, precious metals and rare earths are priced higher. If synthesis of special compounds is required for stability, or an unusual matrix requiring additional stability testing and analytical work is required, the price may be higher. Prices below are for one liter of solution standard containing elements at the indicated concentrations.

	Approximate Price
Each Element up to and including 100 ug/ml	$ 20.00
Each Element from 101-1,000 ug/ml	$ 30.00
Each Element from 1001-10,000 ug/ml	$ 60.00
Each Element from 10,001 ug/ml or greater	$ 100.00
Matrix Set-Up Fee (per liter)	$ 100.00

The prices above are approximate and should be used only as a guideline.
Contact the SPEX Chemical Division for price and delivery quotations.

Set of 9 standards for use in EPA methods 6010 and 200.7 for analysis of trace metals by ICP.

EPA-SET ..... $ 495.00
Includes one each of:

MIXSTD1-100
MIXSTD2-100
MIXSTD3-100
MIXSTD4-100
MIXSTD5-100
INTER18-100
INTER3-100
INTER5-100
INTER1-100
PLBLK-HNO3
PLBLK-HCL

Quality Control Standards for EPA Method 200.7

For ICP trace metal analysis as outlined in EPA method 200.7 and EPA methods manual 600/482-055 "Technical Additions to Methods for Chemical Analysis of Water and Wastes". These standards can be used to check the standard curve, the procedure for interelement correction and other spectral interferences.

Quality Control Standard, 19

QC-19 ..... $ 130.00
Matrix 5% HNO_3, 100ml

Antimony	100 ug/ml
Arsenic	100 ug/ml
Beryllium	100 ug/ml
Cadmium	100 ug/ml
Calcium	100 ug/ml
Chromium	100 ug/ml
Cobalt	100 ug/ml
Copper	100 ug/ml
Iron	100 ug/ml
Lead	100 ug/ml
Magnesium	100 ug/ml
Manganese	100 ug/ml
Molybdenum	100 ug/ml
Nickel	100 ug/ml
Selenium	100 ug/ml
Thallium	100 ug/ml
Titanium	100 ug/ml
Vandium	100 ug/ml
Zinc	100 ug/ml

Quality Control Standard, 7

QC-7 ..... $ 65.00
Matrix 5% HNO_3, 100ml

Aluminum	100 ug/ml
Barium	100 ug/ml
Boron	100 ug/ml
Potassium	1000 ug/ml
Silicon	50 ug/ml
Silver	100 ug/ml
Sodium	100 ug/ml

Set of 2 Quality Control Standards

QC-SET ..... $ 165.00
Includes one each of:
- QC-19
- QC-7

EPA Water Pollution Control Check Standards

For EPA methods manual 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes". The water pollution control check standards may be used either as a standard or as a means to check the individual analyst's accuracy and precision as related to the EPA methods. Refer to methods manual 600/4-79-020, for trace metals I, II and III methods.

Trace Metals I

WP-15 ..... $ 105.00
Matrix 5% HNO_3, 100ml

Aluminum	500 ug/ml
Arsenic	100 ug/ml
Beryllium	100 ug/ml
Cadmium	25 ug/ml
Chromium	100 ug/ml
Cobalt	100 ug/ml
Copper	100 ug/ml
Iron	100 ug/ml
Lead	100 ug/ml
Manganese	100 ug/ml
Mercury	5 ug/ml
Nickel	100 ug/ml
Selenium	25 ug/ml
Vanadium	250 ug/ml
Zinc	100 ug/ml

Trace Metals II

WP-3 ..... $ 40.00
Matrix 2% HNO_3, 100ml

Antimony	20 ug/ml
Silver	10 ug/ml
Thallium	20 ug/ml

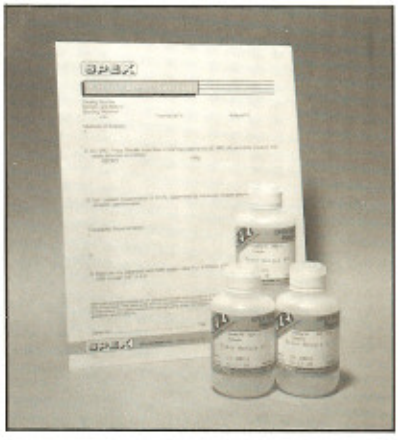
Trace Metals III

#MN-6 ..... $ 65.00
Matrix 2% HNO_3, 100ml

Barium	500 ug/ml
Calcium	500 ug/ml
Magnesium	100 ug/ml
Molybdenum	500 ug/ml
Potassium	100 ug/ml
Sodium	500 ug/ml

Set of 3 Trace Metals

TM-SET ..... $ 180.00
Includes one each of:
- WP-15
- WP-3
- MN-6



For EPA Methods manual 600/4-79-020 and methods manual 600/4-81-055 "Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue".

Trace Metals in Fish

WP-9 ..... $ 75.00
Matrix 5% HNO_3, 100ml

Arsenic	100 ug/ml
Cadmium	5 ug/ml
Chromium	20 ug/ml
Copper	50 ug/ml
Lead	10 ug/ml
Mercury	100 ug/ml
Nickel	20 ug/ml
Selenium	10 ug/ml
Zinc	1000 ug/ml

Alternate Water Pollution and Waste Water Standards for ICP and AA.

Alternate Metals I

#WP-11 ..... $ 80.00
Matrix 2% HNO_3, 100ml

Aluminum ..... 20 ug/ml
Antimony ..... 5 ug/ml
Beryllium ..... 5 ug/ml
Cobalt ..... 10 ug/ml
Copper ..... 10 ug/ml
Iron ..... 20 ug/ml
Manganese ..... 10 ug/ml
Nickel ..... 10 ug/ml
Thallium ..... 5 ug/ml
Vanadium ..... 20 ug/ml
Zinc ..... 10 ug/ml

Alternate Metals III

#MN-4 ..... $ 50.00
Matrix 2% HNO_3, 100ml

Calcium ..... 500 ug/ml
Magnesium ..... 100 ug/ml
Potassium ..... 100 ug/ml
Sodium ..... 500 ug/ml

Set of 2 Alternate Metal Standards

AM-SET ..... $ 110.00
Includes one each of:
WP-11
MN-4

Extracted Metals Pollutant Standards

The standards below are for use in procedures for compliance monitoring of drinking water and for the analysis of ground and surface water where determination at the drinking water contaminant levels are required. EPA SW-846, Method 1310 and National Primary Drinking Water Regulations 40 CRF Part 141. Secondary Metals from EPA Appendix to 200.7 used in Analysis of Drinking Water by ICP.

Primary Drinking Water Metals

#EP-8 ..... $ 65.00
Matrix 2% HNO_3, 100ml
Mercury is supplied as a separate solution due to incompatability with other elements.

Arsenic ..... 10 ug/ml
Barium ..... 100 ug/ml
Cadmium ..... 5 ug/ml
Chromium ..... 10 ug/ml
Lead ..... 10 ug/ml
Selenium ..... 5 ug/ml
Silver ..... 10 ug/ml
Mercury ..... 10 ug/ml

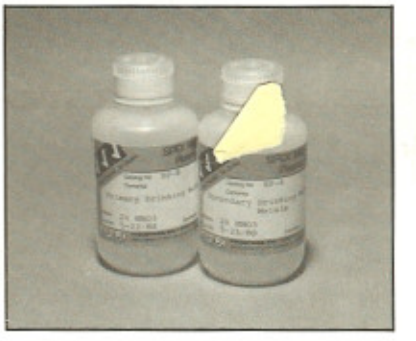
Secondary Drinking Water Metals

#EP-4 ..... $ 50.00
Matrix 2% HNO_3, 100ml

Copper ..... 100 ug/ml
Iron ..... 30 ug/ml
Manganese ..... 5 ug/ml
Zinc ..... 500 ug/ml

Set of 2 Drinking Water Standards

DW-SET ..... $ 100.00
Includes one each of:
EP-8
EP-4

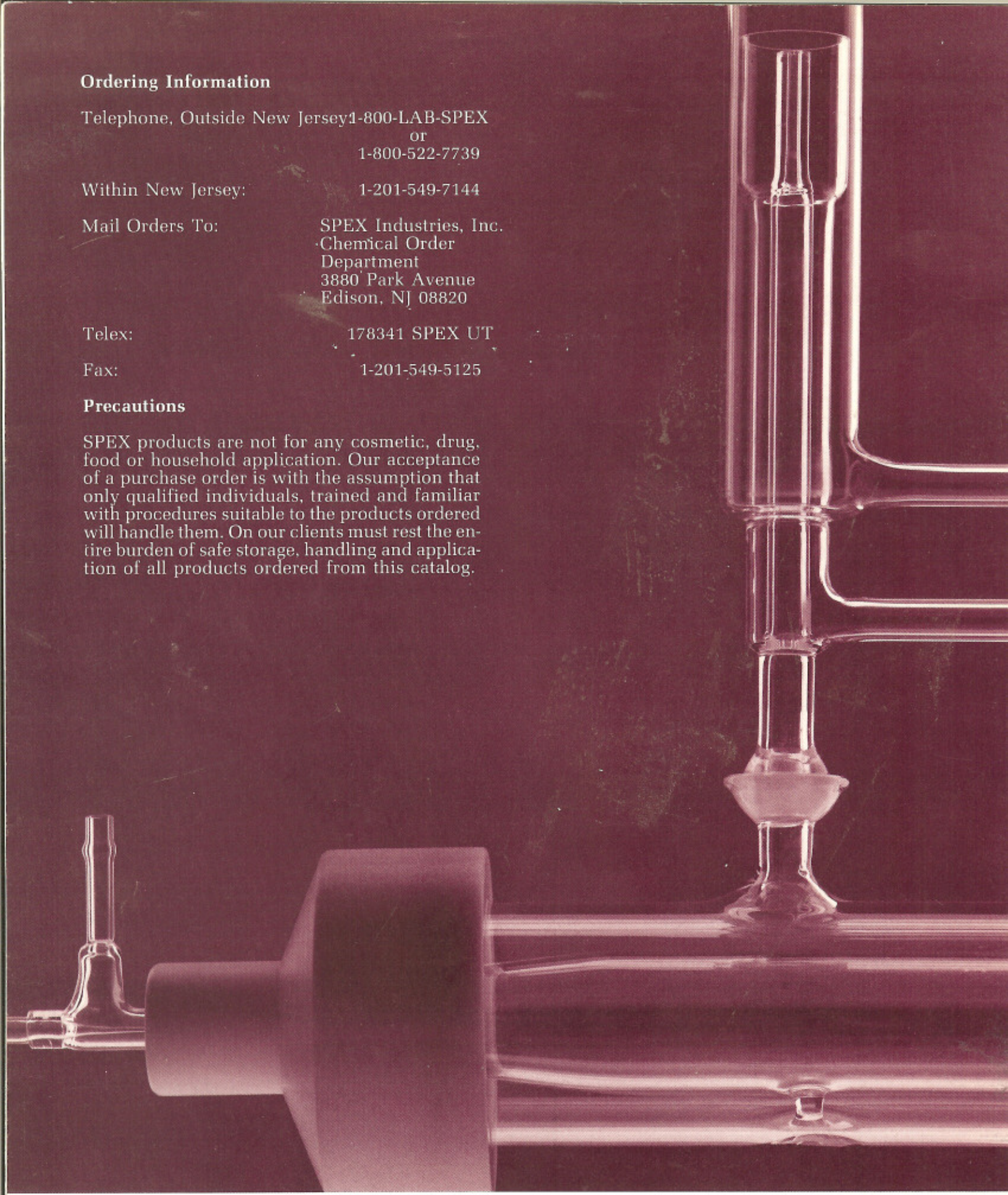


Ordering Information

Telephone, Outside New Jersey	1-800-LAB-SPEX or 1-800-522-7739
Within New Jersey:	1-201-549-7144
Mail Orders To:	SPEX Industries, Inc. Chemical Order Department 3880 Park Avenue Edison, NJ 08820
Telex:	178341 SPEX UT
Fax:	1-201-549-5125

Precautions

SPEX products are not for any cosmetic, drug, food or household application. Our acceptance of a purchase order is with the assumption that only qualified individuals, trained and familiar with procedures suitable to the products ordered will handle them. On our clients must rest the entire burden of safe storage, handling and application of all products ordered from this catalog.



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