



Food and Beverage Compounds, Components and Contaminants

- Sample Homogenization and Grinding
- Sample Extraction and Digestion
- Instrument Preparation
- Analysis



spex.com

Phone: +1.732.549.7144 • +1.800.LAB.SPEX
Fax: +1.732.603.9647
spexsales@antylia.com

Connect with us



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Food and Beverage Compounds, Components and Contaminants

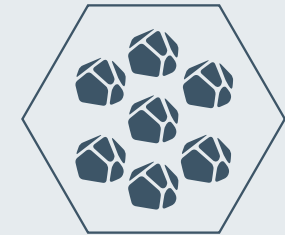
Spex is a market leader of high quality, innovative inorganic and organic certified reference materials, sample preparation equipment and supplies for a diverse range of analytical techniques including chromatography, spectroscopy and PCR. Our products are used in pharma, biomedical, food, beverage, and botanicals laboratories worldwide. Our commitment to our customers is to satisfy their increasing requirements for the highest quality of product, delivery and service.

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Sample Homogenization
and Grinding



Sample Extraction
and Digestion



Instrument
Preparation



Analysis

Food and Beverage Compounds, Components and Contaminants

Step 1 - Sample Homogenization and Grinding



Before one can begin analytical testing of various forms of agricultural and food products, samples must be processed into a form which allows for extraction, digestion and, ultimately, instrumental chemical analysis. Sample processing involves reducing particle size to ensure homogeneity and easy extraction into a suitable mixture for testing. The most common method for obtaining a homogeneous sample is grinding, or comminution. Grinding samples produces reduced particle size in order to increase accuracy and decrease uncertainty.

Particle size reduction is accomplished by either crushing or grinding using forces of impact, attrition, shearing, or compression. Particle reduction of solids occurs in multiple stages starting with the accumulation of defects or stresses in a concentrated location, with increasing strain on a solid which ultimately divides the solid into pieces. The most efficient grinding system is one that applies the minimum amount of energy to rupture the material without adding excess energy or heat. Energy is required to reduce particle size, but it also generates heat which can alter the state of the sample or lead to degradation of the sample. It also then applies the ability to reduce heat generation or negate the effects of heat on the grinding system, which allows for application of more energy into the system to create a more efficient particle size reduction. Spex offers solutions for efficient grinding using cryogenic technologies. The reduction in temperature of a material facilitates grinding and decreases heat and energy used.

Freezer Mills use liquid nitrogen to increase the benefits of cryogenic grinding by negating the plastifying effects of water in agricultural and food samples. Cryogenic grinding also leads to better laboratory analysis because the lack of heat prevents decomposition of less stable analytes, and improves the retention of volatile components such as pesticides, terpenes and flavonoids.

Sample Homogenization and Grinding

Mills and Grinding

Freezer/Mill®

Description	Part #
Freezer/Mill Cryogenic Grinder, 115 V/60 Hz, CE Approved	6775-115
Freezer/Mill High Capacity Cryogenic Grinder, 115 V/60 Hz	6875-115
Freezer/Mill High Capacity with Auto-Fill, 115 V/60 Hz	6875A-115
Freezer/Mill Dual Chamber Cryogenic Grinder, 115 V/60 Hz	6875D-115

Freezer/Mill® – Accessory Packages and Kits

Description	Part #
Small Grinding Vial Accessory Package	6870S
Large Grinding Vial Accessory Package	6870L

Freezer/Mill® – Extractors

Description	Part #
Extractor for Small Vials (Lever)	6756
Extractor for Large Vials (Lever)	6808
Extractor/Vial Opener for Small Grinding Vials	6754
Extractor/Vial Opener for Large/Mid-Size Grinding Vials	6804
Vial Impactor Extractor for Freezer/Mill Vials	6791

Freezer/Mill® – Liquid Nitrogen Handling

Description	Part #
Cryogenic Gloves, Size Small	6900S
Cryogenic Gloves, Size Medium	6900M
Cryogenic Gloves, Size Large	6900L
Cryogenic Gloves, Size Extra-Large	6900XL
Short Cryogenic Transfer Hose	6906
Long Cryogenic Transfer Hose	6907

Sample Homogenization and Grinding

Mills and Grinding

Freezer/Mill® – Racks and Holders	
Description	Part #
Vial Rack for Small Grinding Vials	6755
Vial Rack for Large Grinding Vials	6805

Freezer/Mill® – Sample Adapters	
Description	Part #
Vial Holder for Large Freezer/Mill	6807
Mid-Size Extractor Kit	6808M
Mid-Size Grinding Vial Adapter (Holds 6881 & 6883)	6887
Mid-Size Grinding Vial Adapter (Holds 6885)	6888
Mid-Size Grinding Vial Accessory Package	6870M-1

Freezer/Mill® – Vials and Vial Sets	
Description	Part #
Small Grinding Vial Set	6751
Mid-Size Grinding Vial Set	6881
Mid-Size Poly-Vial Grinding Vial Set	6885
Large Grinding Vial Set	6801
Stainless Steel Grinding Vial Set	6781S
Large Steel Vial Set with O-Rings	6803
Set of 10 O-Rings for 6803 Vial Set	6803S
Small Stainless Steel Impactor for 6751	6751P
Mid-Size Stainless Steel Impactor for 6881	6881P
Large Stainless Steel Impactor for 6801	6801P
Small Stainless Steel End Plugs for 6751	6751E
Mid-Size Stainless Steel End Plugs for 6881	6881E
Mid-Size Polycarbonate End Plugs for 6885	6885E

Sample Homogenization and Grinding

Mills and Grinding

Freezer/Mill® – Vials and Vial Sets (continued)	
Description	Part #
Large Stainless Steel End Plugs for 6801	6801E
Large Stainless Steel End Plugs for 6803	6803E
Mid-Size Vial Adapter for 6804 Extractor/Vial Opener	6884
Mid-Size Polycarbonate Encapsulated Impactor for 6885	6885P
Small Polycarbonate Center Cylinders; Pack of 4	6751C4
Small Polycarbonate Center Cylinders; Pack of 20	6751C20
Mid-Size Polycarbonate Center Cylinders; Pack of 4	6881C4
Mid-Size Polycarbonate Center Cylinders; Pack of 20	6881C20
Large Polycarbonate Center Cylinders; Pack of 4	6801C4
Large Polycarbonate Center Cylinders; Pack of 20	6801C20
Large Stainless Steel Center Cylinder	6802

Geno/Grinder®	
Description	Part #
MiniG, 115 V/60 Hz, 230 V/50 Hz, CE Approved	1600
Geno/Grinder, 115 V/60 Hz, CE Approved	2010-115

Geno/Grinder® – Grinding Media	
Description	Part #
Grinding Balls 3/8" (9.5 mm), Pack of 100	2155
Grinding Balls 7/16" (11 mm), Pack of 100	2156
Grinding Balls 1/2" (13 mm), Pack of 50	2157
Small Low-Chrome Grinding Vial Set	6771
Small Low-Chrome Steel End Plugs	6771E

Sample Homogenization and Grinding

Mills and Grinding

Geno/Grinder® – Racks and Holders

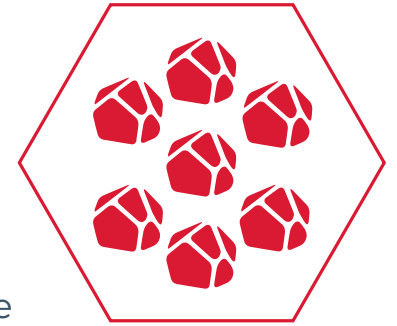
Description	Part #
Holder for Tall 15 mL Vials	1685
Holder for Tall 50 mL Vials	1686
Foam Holder for 15 mL Centrifuge Tubes	2197
Foam Holder for 50 mL Centrifuge Tubes	2196-16-PE
Polyethylene Foam Holder for 2258 Jars	2259

Geno/Grinder® – Vials and Vial Sets

Description	Part #
12 oz (355 mL) Clear Plastic Jar	2248
25 oz (750 mL) PET Jar	2258

Food and Beverage Compounds, Components and Contaminants

Step 2 - Sample Extraction and Digestion



The next step in the analysis process is isolating or changing the analytes or elements from the sample into a form that can be tested by that laboratory. Some of the most common methods of sample processing are extraction and digestion. For inorganic analytes, sample digestion is most often used to break down a physical sample into a homogeneous liquid free of solids, using an acid solution. The acid decomposes the organic matter of the sample and leaves the elemental components in a solution. This sample can then be either further processed or diluted for elemental analysis, for instance, heavy metals in food and agricultural products.

If the analytical targets are organic compounds, other types of separation procedures may be needed, for example, extraction or chromatographic separation. The primary mode of organic sample preparation is extraction in which compounds are leached or transferred from the sample matrix into organic solvents. The target compounds are removed from the sample matrix and partitioned to the extraction medium using simple organic solvents such as alcohols and ethers. In some cases, the extraction solvent can be used directly in instrumental analysis. There are some samples where the matrix has to be changed, so the extraction solvent is evaporated off, and the residue is dissolved in a more appropriate solvent. In other cases, the target analytes must be separated from other material extracted from the sample. Many different types of chromatographic procedures can be used to carry out this type of purification, prior to analysis. This type of chromatographic procedure can be used to isolate targets or clean up matrix rich samples from interfering compounds such as fatty acids or carbohydrates. Spex has a range of preparation products to assist the food and beverage laboratory researcher in the preparation of samples. We carry filters, chromatography media, columns, and solvents all designed with the laboratory in mind.

Sample Extraction and Digestion

Chromatography Columns, Accessories and Solvents

Columns

Description	Part #
Chromatography Column with 1 Fixed and 1 Adjustable Endpiece, 50 x 250 mm	11944-71
Chromatography Column with 2 Fixed Endpieces, 50 x 250 mm	11944-72
Chromatography Column with 1 Fixed and 1 Adjustable Endpiece, 50 x 500 mm	11944-80
Chromatography Column with 2 Fixed Endpieces, 50 x 500 mm	11944-81

Bulk Sorbent

Description	Part #
Flash Chromatography Bulk Sorbent, C18, 100 g	06475-97
Flash Chromatography Bulk Sorbent, C18, 1 kg	06475-98
Flash Chromatography Bulk Sorbent, Silica, 1 kg	06475-89
Flash Chromatography Bulk Sorbent, Silica, 5 kg	06475-90

Cartridges, Racks, Plates and Manifolds

Description	Part #
SPE Cartridges, Silica, 3 mL, 0.5 g, Pack of 50	10937-00
SPE Cartridges, C18, 6 mL, 1 g, Pack of 50	10937-15
Developing Tanks Aluminum Rack, Capacity: Six 10 x 10 cm Plates	34105-40
Preparative Uniplates, 20 x 20 cm UV/Silica G, 1,000 mm Thick, 15 µm, Pack of 25	34103-05
Aluminum-Backed TLC Plate with GF254 Indicator, Silica, 200 x 200 mm, Pack of 20	06475-87
Column Sample Processing Manifold, 24 Columns, 16 x 100 mm Rack	06479-29
Stopcock for Sample Processing Manifold, Pack of 12	06479-65
Column Sample Processing Manifold, 12 Columns, 16 x 100 mm Rack	06480-04

Sample Extraction and Digestion

Chromatography Columns, Accessories and Solvents

Solvents	
Description	Part #
Acetone HPLC Grade, 1 L	88406-18
Acetone HPLC Grade, 4 L	88406-19
Acetone ACS Grade, 1 L	88406-12
Acetone ACS Grade, Glass Bottle, 4 L	88406-16
Acetonitrile, HPLC Grade, 1 L	88405-44
Acetonitrile, HPLC Grade, 4 L	88405-45
Ethyl Acetate, ACS Grade, 4 L	88405-51
Isopropyl Alcohol (IPA), 70% (v/v) Aqueous Solution, 1 Gallon	88400-48
Isopropyl Alcohol (IPA), ACS Grade, 1 L	88405-66
Isopropyl Alcohol (IPA), ACS Grade, 4 L	88405-69
Methanol, HPLC Grade, 1 L	88405-93
Methanol, HPLC Grade, Amber Glass Bottle, 4 L	88401-41
Reagent Alcohol, ACS Reagent Grade, Anhydrous, Absolute, 1 Gallon	88400-66

Food and Beverage Compounds, Components and Contaminants

Step 3 - Instrument Preparation



Once the sample has been homogenized and extracted, it's time to carry out instrumental analysis to determine the concentration of the various components. However, before this is done, it's extremely important to make sure your instruments are in perfect working order. Before testing, analysts should select and install the proper columns. It is also important to check the condition of other instrument consumables, such as lamps and detectors. These should be inspected and replaced if damaged or compromised.

It may also be beneficial to filter the sample to remove particulates and ensure the sample delivery lines in the instrument are not subject to blockage. It may be sufficient to decant extracted samples to appropriate vials for testing. Spex can provide many of your instrument's needs such as columns, lamps and filters, in addition to vials, to fit many of the most commonly used autosamplers.

Instrument Preparation

Vials, Lamps and Filtration

Vials and Accessories

Description	Part #
2 mL Glass Vial, 9 mm Short Thread, Pack of 1,000	98702-65
2 mL Glass Vial with Label, 9 mm Short Thread, Pack of 1,000	98702-67
2 mL Wide Opening Crimp Glass Vial, 11 mm, Pack of 1,000	98705-53
2 mL Wide Opening Crimp Glass Vial with Label and Lines, 11 mm, Pack of 1,000	98705-57
9 mm Short Thread Cap, Open Transparent Polypropylene, Rubber/PTFE Septum, Pack of 1,000	98703-33
9 mm Short Thread Cap, Open Blue Polypropylene, Rubber/PTFE Septum, Pack of 1,000	98703-35
9 mm Short Thread Cap, Open Blue Polypropylene, UltraClean™ Silicone/Red PTFE Septum, Pack of 1,000	98703-48
Silver Aluminum Crimp Cap, 11 mm Diameter, Rubber/Butyl/PTFE Septum with Center Hole, Pack of 1,000	98704-34
Silver Aluminum Crimp Cap, 11 mm Diameter, Silicone/PTFE Septum with Hole, Pack of 1,000	98704-48
F-120X Standard Knurl Fingertip - One-Piece, Natural PEEK, 1/16" Outer Diameter Tubing, 10-32 Coned, Pack of 10	02013-41
HPLC Column, C18, 5 µm, 250 mm Length x 4.6 mm Inner Diameter	06481-96

Deuterium Lamps

Description	Part #
Deuterium Detector Lamp Compatible with Agilent 1100 VWD Detectors	11941-11
Deuterium Detector Lamp Compatible with Agilent 1100/1200 DAD (G1315/G1365 A & B Series)	11941-13
Deuterium Detector Lamp for Waters 2487	11941-36
Deuterium Detector Lamp for Shimadzu SPD-10A, AVP, AV, AVVP, M10AVP, 20A, 20AV	11941-26

Filtration

Description	Part #
KX Filtration System, 500 mL/2 L	12918-14
KX Nylon Syringe Filter, 4 mm Diameter, 0.45 µm, Pack of 100	12915-78
KX Nylon Syringe Filter, 25 mm Diameter, 0.45 µm, Pack of 100	12915-90
KX PTFE Syringe Filter, 4 mm Diameter, 0.45 µm, Pack of 100	12916-58
KX PTFE Syringe Filter, 25 mm Diameter, 0.45 µm Diameter, Pack of 100	12916-69
KX PTFE Membrane Filter, 47 mm Diameter, 0.45 µm Diameter, Pack of 100	12917-97
KH Nylon Membrane Filter, 47 mm Diameter, 0.45 µm, Pack of 100	12917-79

Food and Beverage Compounds, Components and Contaminants

Step 4 - Analysis



Once the sampling process is complete, the sample is ready for analysis. Depending on the nature of the analytes, this will be carried out by gas, or liquid chromatography, or ICP-OES (or MS). The results achieved by these methods can vary from day to day, due to variations in all sorts of instrumental parameters, as well as small variations in sample size. In order to assure consistent and accurate results, analytical chemists use standards, which contain known concentrations of the same substance being analyzed. Standards can be used to confirm the identify of each peak in a chromatogram (qualitative analysis), as well as to calculate the exact concentration of each component (quantitative analysis).

Certified standards, also known as certified reference materials (CRMs), are materials produced by Accredited labs, such as SPEX. Standards in this class follow strict ISO guidelines, and all of the concentrations of analytes are reported on certificates, along with a measure of statistical uncertainty. The analyst compares the observed response in their sample with the response measured for the CRM, and uses this relationship to determine the concentration of the sample, within the range of uncertainty indicated on the certificate. CRMs can also be used to ensure all of the analytical instrumentation is working as expected. Analytically chemists routinely check their instruments with a calibration standard to ensure their equipment is producing consistent data on a daily basis. Spex offers a complete catalog of standards for a laboratory's full range of testing of expected analytes, impurities, as well as instrument calibration.

Analysis

Certified Reference Materials

Premixed Pesticide Multi-Compound CRMs	
Description	Part #
Pesticide Mix 1 containing 16 compounds in Acetonitrile, 1 mL	SPXPR-1
Pesticide Mix 2 containing 15 compounds in Acetonitrile, 1 mL	SPXPR-2
Pesticide Mix 3 containing 15 compounds in Acetonitrile, 1 mL	SPXPR-3
Pesticide Mix 4 containing 15 compounds in Acetonitrile, 1 mL	SPXPR-4
Pesticide Mix 5 containing 14 compounds in Acetonitrile, 1 mL	SPXPR-5
Pesticide Mix 6 containing 15 compounds in Acetonitrile, 1 mL	SPXPR-6
Pesticide Mix 7 containing 8 compounds in Acetonitrile, 1 mL	SPXPR-7
Pesticide Mix 8 containing 15 compounds in Acetonitrile, 1 mL	SPXPR-8
Pesticide Mix 9 containing 16 compounds in Acetonitrile:Acetone (9:1), 1 mL	SPXPR-9
Pesticide Mix 10 containing 15 compounds in Acetonitrile, 1 mL	SPXPR-10
Pesticide Kit containing all 10 Multi-Compound Mixes	SPXPR-KIT

Pesticide Standards	
Description	Part #
Ready-Prep 91 SOW Matrix Spike in Methanol, mL	CLPP-MS91H
3/90 SOW Surrogate Spike in Acetone, 1 mL	CLPP-S90
Organochlorine Pesticide Mix in Benzene, 1 mL	PLCR2-2Y

AOAC Pesticide Standards	
Description	Part #
AOAC Pesticide Mix 1 with 23 components in LC/MS Acetonitrile, 1 mL	AOAC-PEST-1
AOAC Pesticide Mix 2 with 12 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL	AOAC-PEST-2
AOAC Pesticide Mix 3 with 14 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL	AOAC-PEST-3
AOAC Pesticide Mix 4 with 16 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL	AOAC-PEST-4
AOAC Pesticide Mix 5 with 5 components, 100 µg/mL in LC/MS Acetonitrile, 1 mL	AOAC-PEST-5
AOAC Pesticide Mix 6, Dibrom (Naled), 100 µg/mL in HPLC Acetonitrile, 1 mL	AOAC-PEST-6

Analysis

Certified Reference Materials

Carbamate Pesticides

Description	Part #
Analyte Mix A in Acetonitrile, 1 mL	5311-A10

Phthalates

Description	Part #
Phthalate Standard with 8 components in Polyvinyl Chloride (PVC), 1.5 g	CRM-PVC001
Polyvinyl Chloride (PVC) Phthalate Blank, 1.5 g	CRM-PVCBLK
Phthalate Standard with 8 components in Medium Density Polyethylene (PE), 5 g	CRM-PE001
9 Regulated Phthalates and BPA Standard in Medium Density Polyethylene (PE), 5 g	CRM-PE002
Polyethylene (PE) Phthalate Blank, 5 g	CRM-PEBLK
Calibration Standard Phthalates, 1,000 µg/mL in Isooctane, 1 mL	C1001-09

Heavy Metals

Description	Part #
Arsenic at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLAS2-2Y
Cadmium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLCD2-2Y
Chromium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLCR2-2Y
Lead at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLPB2-2Y
Mercury at 1,000 µg/mL in 10% HNO ₃ , 125 mL	PLHG4-2Y
Nickel at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLNI2-2Y
Thallium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLTL2-2Y
Arsenic at 1,000 µg/mL in 2% HNO ₃ , 30 mL	CLAS2-2M
Arsenic at 1,000 µg/mL in 2% HNO ₃ , 125 mL	CLAS2-2Y
Cadmium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	CLCD2-2M
Cadmium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	CLCD2-2Y
Chromium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	CLCR2-2M
Chromium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	CLCR2-2Y

Analysis

Certified Reference Materials

Heavy Metals (continued)

Description	Part #
Mercury at 1,000 µg/mL in 10% HNO ₃ , 30 mL	CLHG4-2M
Mercury at 1,000 µg/mL in 10% HNO ₃ , 125 mL	CLHG4-2Y
Lead at 1,000 µg/mL in 2% HNO ₃ , 30 mL	CLPB2-2M
Lead at 1,000 µg/mL in 2% HNO ₃ , 125 mL	CLPB2-2Y

Essential Minerals and Nutrients

Description	Part #
Calcium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLCA2-2M
Calcium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLCA2-2Y
Calcium at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLCA2-2T
Calcium at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLCA2-2X
Chromium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLCR2-2M
Chromium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLCR2-2Y
Chromium at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLCR2-2T
Chromium at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLCR2-2X
Copper at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLCU2-2M
Copper at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLCU2-2Y
Copper at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLCU2-2T
Copper at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLCU2-2X
Iron at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLFE2-2M
Iron at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLFE2-2Y
Iron at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLFE2-2T
Iron at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLFE2-2X
Magnesium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLMG2-2M
Magnesium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLMG2-2Y
Magnesium at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLMG2-2T
Magnesium at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLMG2-2X

Analysis

Certified Reference Materials

Essential Minerals and Nutrients (continued)	
Description	Part #
Manganese at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLMN2-2M
Manganese at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLMN2-2Y
Manganese at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLMN2-2T
Manganese at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLMN2-2X
Molybdenum at 1,000 µg/mL in H ₂ O, 30 mL	PLMO9-2M
Molybdenum at 1,000 µg/mL in H ₂ O, 125 mL	PLMO9-2Y
Molybdenum at 1,000 µg/mL in H ₂ O, 250 mL	PLMO9-2T
Molybdenum at 1,000 µg/mL in H ₂ O, 500 mL	PLMO9-2X
Phosphorus at 1,000 µg/mL in H ₂ O, 30 mL	PLP9-2M
Phosphorus at 1,000 µg/mL in H ₂ O, 125 mL	PLP9-2Y
Phosphorus at 1,000 µg/mL in H ₂ O, 250 mL	PLP9-2T
Phosphorus at 1,000 µg/mL in H ₂ O, 500 mL	PLP9-2X
Potassium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLK2-2M
Potassium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLK2-2Y
Potassium at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLK2-2T
Potassium at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLK2-2X
Selenium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLSE2-2M
Selenium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLSE2-2Y
Selenium at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLSE2-2T
Selenium at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLSE2-2X
Sodium at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLNA2-2M
Sodium at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLNA2-2Y
Sodium at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLNA2-2T
Sodium at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLNA2-2X
Zinc at 1,000 µg/mL in 2% HNO ₃ , 30 mL	PLZN2-2M
Zinc at 1,000 µg/mL in 2% HNO ₃ , 125 mL	PLZN2-2Y
Zinc at 1,000 µg/mL in 2% HNO ₃ , 250 mL	PLZN2-2T
Zinc at 1,000 µg/mL in 2% HNO ₃ , 500 mL	PLZN2-2X

Analysis

Certified Reference Materials

Heavy Metals and Minerals Testing Kits	
Description	Part #
Heavy Metals Testing Kit Contains: 30 mL each of Mercury, Cadmium, Chromium, Arsenic, and Lead at 1,000 µg/mL concentration along with a Nitric Acid Blank	SPXHM-KIT
Minerals Testing Kit Contains: 30 mL each of Calcium, Magnesium, Iron, Potassium, and Sodium at 1,000 µg/mL concentration along with a Nitric Acid Blank	SPXMT-KIT

Analysis

Certified Reference Materials

Pyrethroids/Pesticides

Description	Part #
Allethrin at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4240
Bifenthrin at 1,000 µg/mL in Acetone, 1 mL	S-494
Bifenthrin at 1,000 µg/mL in Acetonitrile, 1 mL	S-494-ACN
Deltamethrin at 1,000 µg/mL in Methanol-P&T, 1 mL	S-3977
Fenpropathrin at 1,000 µg/mL in Acetone, 1 mL	S-5781
tau-Fluvalinate at 1,000 µg/mL in Acetone, 1 mL	S-4161
trans-Permethrin (mix of isomers) at 1,000 µg/mL in Acetone, 1 mL	S-5732
d-(cis-trans)-Phenothrin at 1,000 µg/mL in Acetone, 1 mL	S-3041
Prallethrin at 1,000 µg/mL in HPLC Grade Acetonitrile, 1 mL	LCS-5783
Resmethrin at 1,000 µg/mL in Acetone, 1 mL	S-3252
Tetramethrin at 1,000 µg/mL in Acetone, 1 mL	S-4251-AC
Tetramethrin at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4251

Terpenes

Description	Part #
Bisabolene at 1,000 µg/mL in Methanol-P&T, 1 mL	S-502
Borneol at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4570
Camphene at 1,000 µg/mL in Methanol-P&T, 1 mL	S-710
3-Carene at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4171
2-Ethyl-Fenchol at 1,000 µg/mL in Ethanol, 1 mL	S-4952
Eucalyptol at 1,000 µg/mL in Methanol, 1 mL	S-4352
Farnese at 1,000 µg/mL in Methanol-P&T, 1 mL	S-1989
Isoprene at 1,000 µg/mL in Methanol-P&T, 1 mL	S-2300
(R)-(+)-Limonene at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4021
Linalool at 1,000 µg/mL in Methanol, 1 mL	S-5133
Menthol at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4669

Analysis

Certified Reference Materials

Terpenes (continued)

Description	Part #
beta-Myrcene at 1,000 µg/mL in Hexane, 1 mL	S-2654
alpha-Pinene at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4172
beta-Pinene at 1,000 µg/mL in Methanol-P&T, 1 mL	S-3142
(+)-Pulegone at 1,000 µg/mL in Methanol, 1 mL	S-5136
alpha-Terpineol at 1,000 µg/mL in Acetone, 1 mL	S-3356-AC
alpha-Terpineol at 1,000 µg/mL in Methanol-P&T, 1 mL	S-4145
CAN-TERP Mix 1 at 100 µg/mL in Methanol, 1 mL	TERP-MIX1
CAN-TERP Mix 1 (High Level) at 1,000 µg/mL in Methanol, 1 mL	TERP-MIX1H
CAN-TERP Mix 2 at 100 µg/mL in Methanol, 1 mL	TERP-MIX2
CAN-TERP Mix 2 (High Level) at 1,000 µg/mL in Methanol, 1 mL	TERP-MIX2H
CAN-TERP Kit at 100 µg/mL in Methanol, 1 mL	TERP-KIT
CAN-TERP Kit (High Level) at 1,000 µg/mL in Methanol, 1 mL	TERP-KIT-H

Flavonoids

Description	Part #
Flavonoid Standard in Dimethyl Sulfoxide, 1 mL	FLAVIN-1

Analysis

Certified Reference Materials

Residual Solvents	
Description	Part #
Acetone at 1,000 µg/mL in Methanol-P&T, 1 mL	S-140
n-Butane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-605
Ethane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-1880
Ethanol at 1,000 µg/mL in Methanol-P&T, 1 mL	S-1885
n-Hexane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-2190
Methane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-2379
2-Methylbutane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-2462
2-Methylpropane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-2555
n-Pentane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-2975
Propane at 1,000 µg/mL in Methanol-P&T, 1 mL	S-3145
2-Propanol at 1,000 µg/mL in Methanol-P&T, 1 mL	S-3165
Residual Solvent Mix, 24 Components at 1,000 µg/mL in Dimethyl Sulfoxide, 1 mL	USP-RS-C3A

Analysis

Certified Reference Materials

Vitamin Standards		
Description	Vitamin Group	Part #
beta-Carotene	Vitamin A	S-10105
Retinol	Vitamin A	S-3820
Retinyl Palmate	Vitamin A	S-10189
Xanthophyll beta-Cryptoxanthin	Vitamin A	S-10104
Thiamine	Vitamin B1	S-6639
Riboflavin	Vitamin B2	S-6641
Niacin	Vitamin B3	S-6642
Nicotinamide	Vitamin B3	S-4016
Inositol	Vitamin B7 (France)	S-10896
Cyanocobalamin	Vitamin B12	S-7517
Ascorbic acid	Vitamin C	S-4034
Ergocalciferol (D2)	Vitamin D2	S-10504
Cholecalciferol (D3)	Vitamin D3	S-3815
alpha-Tocopherol	Vitamin E	S-11871
delta-Tocopherol	Vitamin E	S-6843
gamma-Tocopherol	Vitamin E	S-6842
Phytomenadione	Vitamin K1	S-10505
Menadione	Vitamin K3	S-10507

spex.com

Phone: +1.732.549.7144 • +1.800.LAB.SPEX
 Fax: +1.732.603.9647
 spexsales@antylia.com

4772AV.1

Connect with us



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