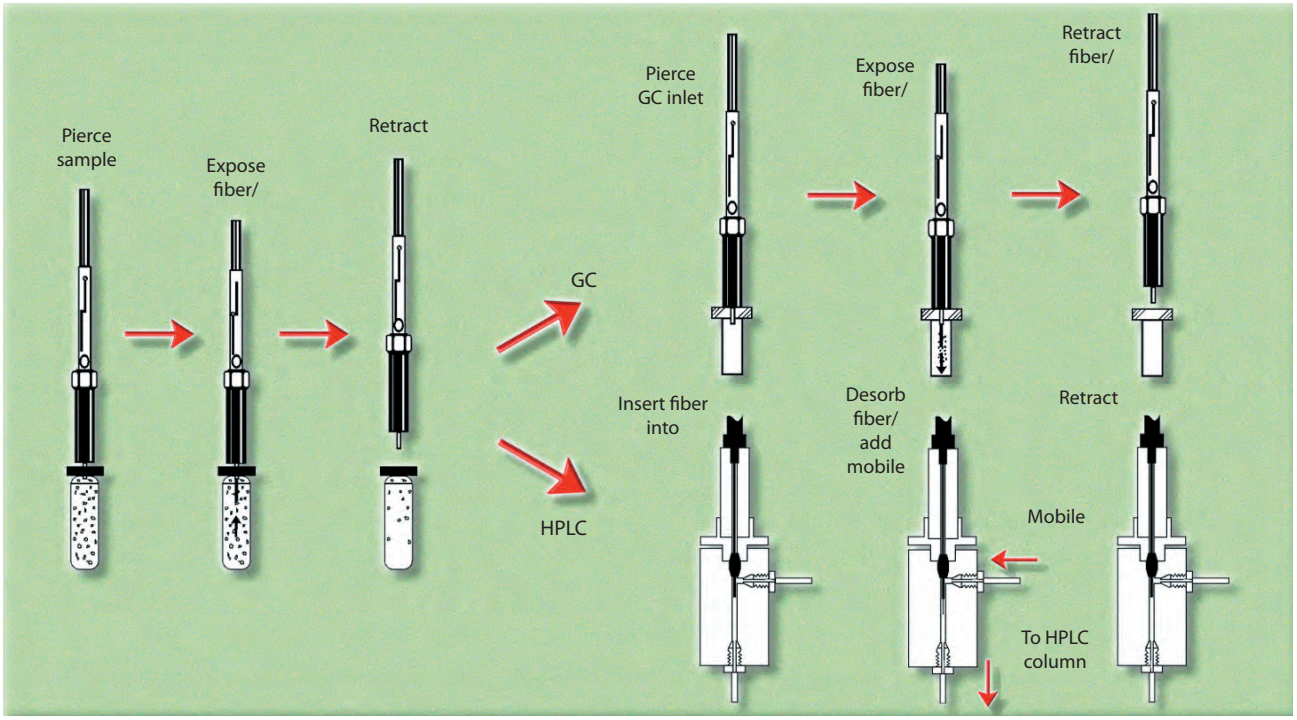
SOLID PHASE MICROEXTRACTION

Introduction to SPME

Introduction to SPME

Solid Phase Microextraction: A Simple Sample Extraction Process



The extraction of organic compounds from a sample matrix usually consists of purge-and-trap or headspace methods for concentrating volatiles; and liquid-liquid extraction, solid phase extraction, or supercritical fluid extraction for semivolatiles and nonvolatiles. These methods have various drawbacks, including high cost and excessive preparation time. A unique sample preparation technique, SPME, eliminates most drawbacks to extracting organics.

SPME requires no solvents or complicated apparatus. It can concentrate volatile and nonvolatile compounds, in both liquid and gaseous samples, for analysis by GC, GC-MS, or HPLC.

SPME offers some important advantages:

- Fast – reduces sample preparation time by 70%
- Solvent reduction – minimizes the use of solvents, and their disposal
- Economical and reusable – more than 50 extractions per fiber on average
- Versatile – adapts to any GC or HPLC system, can be automated

An SPME unit consists of a length of fused silica fiber coated with a polymer material, in some cases mixed with a solid adsorbent (e.g., a divinylbenzene polymer or porous carbon). The fiber is attached to a stainless steel plunger sheathed by a protective needle.

The SPME operating steps are simple:

Sample Extraction

- With the fiber retracted, pass the needle through the sample vial septum.
- Depress the plunger to expose the fiber to the liquid sample or the headspace above the sample.
- Analytes adsorb to the fiber in 2 to 30 minutes.
- Retract the fiber into the needle and remove the needle from the sample vial.

GC Analysis

- Insert the needle into the GC injector port.
- Depress the plunger, exposing the fiber in the heated zone of the injector to desorb the analytes onto the column.
- Retract the fiber and remove the needle.

HPLC Analysis

- Insert the needle into the SPME/HPLC interface desorption chamber (injection valve in load position).
- Expose the fiber and close the sealing clamp.
- Switch the injection valve to "inject." Mobile phase will flow through the chamber, desorb the analytes and carry them to the column.
- Switch the injection valve to "load," retract the fiber, and remove the needle.

Introduction to SPME

Choose a Fiber According to the Analytes You Want to Extract

In SPME, you can adsorb analytes from a liquid sample, by immersion or headspace extraction, or a solid sample, by headspace extraction, using a polymer-coated fused silica fiber. Analytes are desorbed from the fiber by exposing the fiber in the injection port of a GC or in the desorption chamber of an SPME/HPLC interface.

Determine the type of fiber you need according to the molecular weights and polarity of the analytes.

- Low molecular weight or volatile compounds usually require a 100 µm polydimethylsiloxane (PDMS)-coated fiber.
- Larger molecular weight or semivolatile compounds are more effectively extracted with a 30 µm PDMS fiber or a 7 µm PDMS fiber.
- To extract very polar analytes from polar samples, use an 85 µm polyacrylate-coated fiber.
- More volatile polar analytes, such as alcohols or amines, are adsorbed more efficiently and released faster with a 65 µm polydimethylsiloxane/divinylbenzene (PDMS/DVB)-coated fiber.
- A 60 µm PDMS/DVB fiber is a general purpose fiber for HPLC.
- For trace-level volatiles analysis, use a 75 µm PDMS/ Carboxen® fiber.
- For an expanded range of analytes (C3-C20), use a 50/30 divinylbenzene/Carboxen® on PDMS fiber.

Some typical applications for SPME are:

- Environmental analyses of water samples
- Headspace analysis of trace impurities in polymers and solid samples
- ppt odor analyses
- Flavor analyses of food products
- Forensic analyses of arson/explosives samples
- Toxicology analyses: blood alcohol or drugs in urine/serum
- Surfactants, other industrial applications

Most of these fibers are compatible with HPLC solvents, but the 100 µm and 30 µm PDMS-coated fibers cannot be used with hexane.

SPME fiber holders are available in two versions, one for manual use and one for use with autosamplers or with our SPME/HPLC interface. Both versions include the following features:

- A handtight needle hub assembly for quick interchange of fibers.
- A window in the barrel, to identify the fiber by its color-coded hub.

The manual holder has an adjustable needle gauge that controls the depth of fiber introduction into the sample vial or injection port. A spring retracts the fiber into the protective needle and a locking mechanism secures the fiber in the exposed position during extraction or desorption.

The automated holder is similar in design to the manual version. The autosampler controls fiber movement, allowing automatic sample extraction.The automated holder also is required for use with an SPME/HPLC interface.

A specialized type of manual SPME holder, the SPME portable sampler, allows you to concentrate organics from air or water, in the field, then store them for transport to the laboratory.

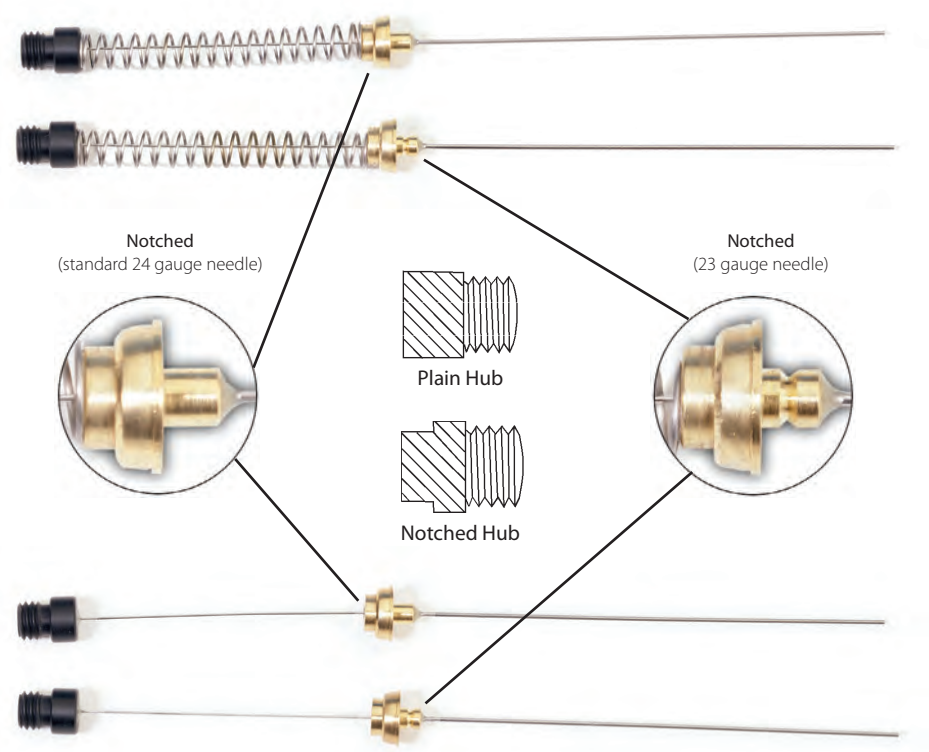
High Recovery vial

Fiber Selection Guide

Analyte Type (Molecular Weight)	Recommended Fiber
Gases and low molecular weight compounds (MW 30-225)	75 µm/85 µm Carboxen/polydimethylsiloxane
Volatiles (MW 60-275)	100 µm polydimethylsiloxane
Volatiles, amines and nitro-aromatic compounds (MW 50-300)	65 µm polydimethylsiloxane/divinylbenzene
Polar semi-volatiles (MW 80-300)	85 µm polyacrylate
Non-polar high molecular weight compounds (MW 125-600)	7 µm polydimethylsiloxane
Non-polar semi-volatiles (MW 80-500)	30 µm polydimethylsiloxane
Alcohols and polar compounds (MW 40-275)	60 µm Carbowax (PEG)
Flavor compounds: volatiles and semi-volatiles, C3-C20 (MW 40-275)	50/30 µm divinylbenzene/Carboxen on polydimethylsiloxane on a StableFlex fiber
Trace compound analysis (MW 40-275)	50/30 µm divinylbenzene/Carboxen on polydimethylsiloxane on a 2 cm StableFlex fiber
Amines and polar compounds (HPLC use only)	60 µm polydimethylsiloxane/divinylbenzene

Introduction to SPME

Fiber Assembly Used with SPME Holder 57330-U (For Manual Use)



Fiber Assembly Used with SPME Holders 57331 and 57347-U

Fiber Assemblies and Holders

SPME Metal alloy fiber assemblies

The SPME metal alloy fiber assemblies are manufactured with a flexible metal alloy used in the needle, plunger, and fiber core. The new metal alloy design includes a thicker, flexible plunger that is much less likely to kink or break, and helps to reinforce the needle especially when used in an auto-sampler with a sample agitator. Since the needle is more flexible and has a thinner wall than the standard stainless steel needle, a bevel has been placed on the needle to help it pierce septa materials more easily. As a result of this thinner needle wall and beveled tip, septa coring will occur more frequently requiring the use of the Merlin Microseal™ or similar septum-less sealing system. The alloy used in the metal fiber assemblies does not contain any iron and is more inert than stainless steel.

Coating	For Use With	Needle	Hub	Material	Cat. No.	Qty
SPME fiber assembly Polydimethylsiloxane (PDMS)						
100 µm	autosampler	23 ga	red plain	metal alloy	57928-U	1 ea
SPME fiber assembly Divinylbenzene/Carboxen/Polydimethylsiloxane (DVB/CAR/PDMS)						
50/30 µm	autosampler	23 ga	gray plain	metal alloy	57914-U	1 ea
50/30 µm	autosampler	23 ga	gray plain	metal alloy	57912-U	1 ea
SPME fiber assembly Polydimethylsiloxane/Divinylbenzene (PDMS/DVB)						
65 µm	autosampler	23 ga	pink plain	metal alloy	57902-U	1 ea
SPME fiber assembly Carboxen/Polydimethylsiloxane(CAR/PDMS)						
85 µm	autosampler	23 ga	light blue plain	metal alloy	57906-U	1 ea

SPME Fiber Assemblies

SPME fiber assemblies can be reused for up to 100 analyses, or more, depending on the application and the care they are given. For reuse, simply condition with heat before and after every analysis. Solvent can be used for HPLC applications or when heat does not sufficiently clean the fiber. Each assembly has a color-coded or notched hub indicating the type of coating on the fiber. Choose the assembly that is appropriate for the holder: manual or autosampler/HPLC. First time SPME users must order both a holder and a fiber assembly. The key to proper SPME performance is fiber selection, below are some guidelines for choosing the proper fiber.

Fiber Assemblies and Holders

Coating type and thickness

As a first step, identify the type and molecular weight range of the analytes to be extracted. Higher molecular weight compounds desorb easier from the 7µm or 30µm PDMS absorption fiber coatings compared to the 100µm PDMS or adsorbent fibers (see Table A). Smaller molecules are retained in the pores of the fibers containing adsorbents in the coating; e.g. Carboxen, divinylbenzene particles. Further, refine your choice by matching the fiber coating relative to analyte polarity.

Needle gauge

The SPME fiber is protected by the needle during insertion through the septum and when not exposed for sampling. The original SPME fibers were manufactured with 24 gauge needles, and these continue to work very well for manual sampling. More recently we have developed SPME fibers with 23 gauge needles and highly recommend the 23 gauge be used for all applications utilizing an autosampler. The 23 gauge needles also work well with the Merlin Microseal septum system, as well as other septum-less seals. Try to avoid using the 23 gauge needles with standard silicone septa, as they may core the septum.

Fiber core material

SPME fibers were first coated on a fused silica core. More recently the StableFlex SPME fibers have been improved by applying the coating on a flexible fused silica core. The coating partially bonds to the flexible core which results in a more stable coating and a less breakable fiber. The extraction selectivity of StableFlex fibers however may be slightly different from the same coating on a standard fused silica core.

Coating	For Use With	Needle	Hub	Material	Cat. No.	Qty
SPME fiber assembly Carboxen/Polydimethylsiloxane(CAR/PDMS)						
75 µm	manual holder	24 ga	black plain	fused silica	57318	3 ea
75 µm	manual holder	23 ga	black plain	fused silica	57344-U	3 ea
75 µm	autosampler	24 ga	black plain	fused silica	57319	3 ea
75 µm	autosampler	23 ga	black plain	fused silica	57343-U	3 ea
85 µm	manual holder	24 ga	light blue plain	StableFlex	57334-U	3 ea
85 µm	autosampler	24 ga	light blue plain	StableFlex	57335-U	3 ea
85 µm	autosampler	23 ga	light blue plain	StableFlex	57295-U	3 ea
SPME fiber assembly Polydimethylsiloxane (PDMS)						
100µm	manual holder	24 ga	red plain	fused silica	57300-U	3 ea
30 µm	manual holder	24 ga	yellow plain	fused silica	57308	3 ea
100µm	autosampler	24 ga	red plain	fused silica	57301	3 ea
30 µm	autosampler	24 ga	yellow plain	fused silica	57309	3 ea
7 µm	autosampler	24 ga	green plain	fused silica	57303	3 ea
100µm	autosampler	23 ga	red plain	fused silica	57341-U	3 ea
7 µm	manual holder	24 ga	green plain	fused silica	57302	3 ea
100µm	manual holder	23 ga	red plain	fused silica	57342-U	3 ea
7 µm	autosampler	23 ga	green plain	fused silica	57291-U	3 ea
30 µm	autosampler	23 ga	yellow plain	fused silica	57289-U	3 ea
SPME fiber assembly Polydimethylsiloxane/Divinylbenzene (PDMS/DVB)						
65 µm	manual holder	24 ga	blue plain	fused silica	57310-U	3 ea
65 µm	manual holder	23 ga	blue plain	fused silica	57346-U	3 ea
65 µm	autosampler	24 ga	blue plain	fused silica	57311	3 ea
60 µm	autosampler/HPLC	24 ga	brown notched	StableFlex	57317	3 ea
65 µm	autosampler	23 ga	blue plain	fused silica	57345-U	3 ea
65 µm	manual holder	24 ga	pink plain	StableFlex	57326-U	3 ea
65 µm	autosampler	24 ga	pink plain	StableFlex	57327-U	3 ea
65 µm	autosampler	23 ga	pink plain	StableFlex	57293-U	3 ea
SPME fiber assembly polyacrylate (PA)						
85 µm	manual holder	24 ga	white plain	fused silica	57304	3 ea
85 µm	autosampler	24 ga	white plain	fused silica	57305	3 ea
85 µm	autosampler	23 ga	white plain	fused silica	57294-U	3 ea
SPME fiber assembly Divinylbenzene/Carboxen/Polydimethylsiloxane (DVB/CAR/PDMS)						
50/30µm	manual holder	24 ga	gray plain	StableFlex	57328-U	3 ea
50/30 µm	autosampler	24 ga	gray plain	StableFlex	57329-U	3 ea
50/30µm	manual holder/ autosampler	24 ga	gray notched	StableFlex (2 cm)	57348-U	3 ea
50/30 µm	autosampler	23 ga	gray plain	StableFlex	57298-U	3 ea
50/30 µm	manual holder/ autosampler	23 ga	gray notched	StableFlex	57299-U	3 ea
SPME fiber assembly, Carbowax-Polyethylene Glycol (PEG) Coating						
60 µm	autosampler	23 ga	purple plain	metal alloy	57354-U	3 ea
60 µm	manual holder	23 ga	purple plain	metal alloy	57355-U	3 ea

Fiber Assemblies and Holders

SPME PTFE Sealing Caps

for use with 23 GA fibers

Sealing caps protect the SPME fiber assembly from accidental damage to the needle tip and from contamination by dust and dirt. The caps also provide an airtight seal which protects the 23 gauge SPME fibers from contamination or loss of analytes when using adsorbent fiber coatings.

PTFE

57454-U	3 ea

SPME Fiber Assortment Kits

For Use With	Needle	Cat. No.	Qty
SPME StableFlex™ fiber assortment kit			
manual holder	24 ga	57550-U	1 kit
autosampler	24 ga	57551-U	1 kit
autosampler	23 ga	57284-U	1 kit
SPME fiber assortment kit 1			
manual holder	24 ga	57306	1 kit
autosampler	24 ga	57307	1 kit
autosampler	23 ga	57285-U	1 kit
SPME fiber assortment kit 2			
manual holder	24 ga	57320-U	1 kit
autosampler	24 ga	57321-U	1 kit
autosampler	23 ga	57286-U	1 kit
SPME fiber assortment kit 3			
autosampler	24 ga	57323-U	1 kit
SPME fiber assortment kit 4			
manual holder	24 ga	57324-U	1 kit
autosampler	24 ga	57325-U	1 kit
autosampler	23 ga	57287-U	1 kit
SPME fiber assortment kit 5			
autosampler	23 ga	57362-U	4 ea

The SPME fiber assortment kits consist of 1 fiber each of the types listed below.

SPME StableFlex Fiber Assortment Kit

- 65 µm PDMS/DVB coating
- 50/30 µm DVB/Carboxen/PDMS coating
- 85 µm Carboxen/PDMS coating
- 85 µm polyacrylate coating

Kit 1 – For Volatiles and Semivolatiles

- 85 µm polyacrylate coating
- 100 µm polydimethylsiloxane coating
- 7 µm polydimethylsiloxane coating

Kit 2 – For Volatile or Polar Organics in Water

- 75 µm Carboxen/polydimethylsiloxane coating
- 65 µm polydimethylsiloxane/divinylbenzene coating
- 85 µm polyacrylate coating

Kit 3 – For SPME/HPLC Analysis

- 60 µm polydimethylsiloxane/divinylbenzene coating
- 85 µm polyacrylate coating
- 100 µm polydimethylsiloxane coating

Kit 4 – For Flavors and Odors

- 100 µm polydimethylsiloxane coating
- 65 µm polydimethylsiloxane/divinylbenzene coating
- 75 µm Carboxen/polydimethylsiloxane coating

Kit 5 – For Flavors and Odors

- 100 µm polydimethylsiloxane coating
- 65 µm polydimethylsiloxane/divinylbenzene coating
- 85 µm Carboxen/polydimethylsiloxane coating
- 50/30 µm Divinylbenzene/carboxen/polydimethylsiloxane coating

Related Information

Applications involving SPME are included in the Applications section at the end of this chapter. Titles of our SPME publications appear before the Applications section. For a list of SPME journal articles, contact our Technical Service chemists, or visit our website: **sigma-aldrich.com/SPME**.

SPME Fiber Holder

The holder protects the coated fiber, and controls exposure of the fiber during analyte adsorption and desorption. The holder is reusable indefinitely and accepts the replaceable fiber assembly. First time users must order both a holder and a fiber assembly.

Fiber Holder for Manual Sampling

An adjustable depth guide positions the fiber for sampling and for correct placement in the heated zone of the GC injection port. The fiber can be locked in the exposed position.

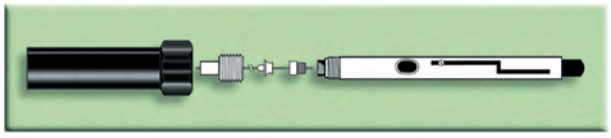
Fiber Holder for Automated Sampling or HPLC Analysis

Use this fiber holder with a Varian 8100/8200 AutoSampler or with our SPME/HPLC interface. An SPME upgrade kit is necessary for operation with the Varian AutoSampler - contact Varian Instrument Division for information concerning system requirements.

Fiber Holder for CTC Combi PAL and Varian 8400/8410 Autosampler

Use this holder with SPME fiber assemblies that are designed for automated sampling. CTC autosampler distributed by Varian, Leap and Gerstel (MPS3).

Top to Bottom: 57331, 57330-U, 504831



Fiber Holder disassembled

Description	Cat. No.	Qty
SPME Fiber Holder, for use with manual sampling	57330-U	1 ea
SPME Fiber Holder, for use with Varian Autosampler or HPLC	57331	1 ea
SPME Fiber Holder, for use with CTC CombiPal, Gerstel MPS 2 and Thermo TriPlus Autosamplers	57347-U	1 ea

Fiber Assemblies and Holders

SPME Fast Fit Fiber Assemblies (FFA) and Multi-Fiber Exchanger

SPME Fast Fit Fiber Assemblies (FFA) and Multi-Fiber Exchanger

NEW PRODUCTS

Multi Fiber EXchanger (MFX) System

The Multi Fiber EXchanger (MFX) was designed to allow automated consecutive extraction and desorption for a number of SPME fibers, without the need for manual change-out of the fiber in the autosampler holder. It was developed and is produced by Chromline s.r.l. Prato/Italy. SPME Multi-Fiber stations for 3 fibers or for 25 fibers are available from GERSTEL GmbH & Co. KG.

SPME Fast Fit Fiber Assemblies (FFA)

The SPME Fast Fit Assemblies (FFA) are a new configuration of SPME fibers allowing an automated exchange of SPME fibers by the Multi Fiber eXchanger (MFX) unit of an autosampler. The barcoded SPME FFAs in use with the Multi Fiber eXchanger (MFX) system offer the following benefits:

- No manual switching out of the fiber when performing extractions with various SPME phases.
- Automated screening for optimal selectivity in SPME method development by setting up different SPME phase selectivities.
- Analyte polarity range enhancement as a result of extraction with various phases.

for use with multi fiber exchanger

Coating	For Use With	Needle	Hub	Material	Cat. No.	Qty
SPME fiber assembly Polydimethylsiloxane (PDMS)						
100 µm	multi fiber exchanger	24 ga	red plain	fused silica	FFA57301	3 ea
30 µm	multi fiber exchanger	23 ga	yellow plain	fused silica	FFA57289-U	3 ea
7 µm	multi fiber exchanger	23 ga	green plain	fused silica	FFA57291-U	3 ea
SPME fiber assembly Polydimethylsiloxane/Divinylbenzene (PDMS/DVB)						
65 µm	multi fiber exchanger	23 ga	pink plain	-	FFA57293-U	3 ea
SPME fiber assembly polyacrylate (PA)						
85 µm	multi fiber exchanger	23 ga	white plain	fused silica	FFA57294-U	3 ea
SPME fiber assembly Carboxen/Polydimethylsiloxane(CAR/PDMS)						
85 µm	multi fiber exchanger	23 ga	light blue plain	-	FFA57295-U	3 ea
SPME fiber assembly Divinylbenzene/Carboxen/Polydimethylsiloxane (DVB/CAR/PDMS)						
50/30 µm	multi fiber exchanger	23 ga	gray plain	-	FFA57298-U	3 ea
SPME fiber assembly Polydimethylsiloxane (PDMS)						
7 µm	multi fiber exchanger	24 ga	green plain	fused silica	FFA57302	3 ea
SPME fiber assembly polyacrylate (PA)						
85 µm	multi fiber exchanger	24 ga	white plain	fused silica	FFA57305	3 ea
SPME fiber assembly Polydimethylsiloxane (PDMS)						
30 µm	multi fiber exchanger	24 ga	yellow plain	fused silica	FFA57309	3 ea
SPME fiber assembly Polydimethylsiloxane/Divinylbenzene (PDMS/DVB)						
65 µm	multi fiber exchanger	24 ga	pink plain	StableFlex	FFA57327-U	3 ea
SPME fiber assembly Divinylbenzene/Carboxen/Polydimethylsiloxane (DVB/CAR/PDMS)						
50/30 µm	multi fiber exchanger	24 ga	gray plain	StableFlex	FFA57329-U	3 ea
SPME fiber assembly Carboxen/Polydimethylsiloxane(CAR/PDMS)						
85 µm	multi fiber exchanger	24 ga	light blue plain	-	FFA57335-U	3 ea
SPME fiber assembly Polydimethylsiloxane (PDMS)						
100 µm	multi fiber exchanger	23 ga	red plain	fused silica	FFA57341-U	3 ea
SPME fiber assembly, Carbowax-Polyethylene Glycol (PEG) Coating						
60 µm	multi fiber exchanger	23 ga	purple plain	metal alloy	FFA57354-U	3 ea

Fiber Assemblies and Holders

SPME Fast Fit Fiber Assemblies (FFA) and Multi-Fiber Exchanger

SPME StableFlex™ fiber assortment kit

SPME StableFlex Fiber Assortment Kit contains one fiber of each:

- 65µm PDMS/DVB coating
- 50/30µm DVB/Carboxen/PDMS coating
- 85µm Carboxen/PDMS coating
- 85µm Polyacrylate coating

needle size 23 ga, for use with multi fiber exchanger

FFA57284-U	1 kit

SPME fiber assortment kit 1

Kit 1 - For Volatiles and Semivolatiles - contains one fiber of each:

- 85µm polyacrylate coating
- 100µm polydimethylsiloxane coating
- 7µm polydimethylsiloxane coating

needle size 23 ga, for use with multi fiber exchanger

FFA57285-U	1 kit

SPME fiber assortment kit 2

Kit 2 - For Volatile or Polar Organics in Water - contains one of each

- 75µm Carboxen/polydimethylsiloxane coating
- 65µm polydimethylsiloxane/divinylbenzene coating
- 85µm Polyacrylate coating

for analyte group volatile and polar organics in water

needle size 23 ga, for use with multi fiber exchanger

FFA57286-U	1 kit

SPME fiber assortment kit 4

Kit 4 - For Flavors and Odors - contains one of each:

- 100µm polydimethylsiloxane coating
- 65µm polydimethylsiloxane/divinylbenzene coating
- 75µm Carboxen/polydimethylsiloxane coating

needle size 23 ga, for use with multi fiber exchanger

FFA57287-U	1 kit

SPME fiber assortment kit 5

SPME Fiber Assortment Kit 5 contains one fiber of each:

- 65µm PDMS/DVB coating
- 50/30µm DVB/Carboxen/PDMS coating
- 85µm Carboxen/PDMS coating
- 100µm PDMS coating

needle size 23 ga, for use with multi fiber exchanger

FFA57362-U	1 kit

SPME FFA Field Sampler

57554-U	1 ea

Diffusive Sampling Fiber Holder for SPME FFA

A holder for SPME FFA capable of determining the time-weighted average (TWA) concentration of volatile organic compounds (VOCs) in air. Unlike conventional sampling with SPME in which the fiber is extended outside the needle, during TWAS passive sampling the fiber is retracted a known distance inside the needle. The sample collect VOCs by the mechanism of molecular diffusion and sorption onto the fiber.

57584-U	1 ea

Fiber Assemblies and Holders

SPME Fast Fit Fiber Assemblies (FFA) and Multi-Fiber Exchanger

SPME FFA Storage Device

SPME Storage Devices

Devices for safely storing conventional SPME fiber assemblies or SPME Fast Fit Assemblies (FFA) to maintain fiber conditioning prior to sampling and sample integrity after sampling. The storage containers are ideal for shipping fibers to and from sampling sites or just to keep them clean and ready for sampling in the laboratory.

for use with SPME FFA

57592-U	1 ea

SPME Fiber Assembly Storage Device

for use with (SPME Fiber Assemblies)

57589-U	1 ea

SPME Fibers for LC Analysis

NEW PRODUCTS

SPME-LC Fiber Probe

functional group C18

The SPME-LC fiber probes are intended as single-use devices for the extraction of small molecules out of a fluid followed by solvent desorption and LC analysis.

for use with solvent desorption

red hub plain

metal alloy

coating ..... 45 µm

SPME probes for bioanalytical applications. Bottom image shows the fiber exposed from the needle.

57281-U	5 ea

SPME Samplers

SPME Samplers

SPME Portable Field Samplers

Concentrate and Store Analytes from Water; Sample Indoor Air - The SPME portable field sampler is an efficient and economical way of extracting and transporting volatile and semivolatile compounds from field samples. Extracted compounds storage losses for pesticides extracted and stored using a portable field sampler were significantly lower than losses from stored whole water samples. The sampler can be reused 50-100 times, and is disposed of when the fiber is no longer usable.

The portable field sampler also efficiently detects organic compounds in air. In our studies, the sampler allowed us to monitor typical HPLC and GC solvents at ppb levels in laboratory air. Three fibers are available: a polydimethylsiloxane
(PDMS)/Carboxen fiber for trace levels of volatiles, a general purpose PDMS fiber and a PDMS/DVB fiber for semi-volatiles and larger volatiles.

Five slots in the needle guide/depth gauge control the depth of needle insertion into a sample container, or into the injection port during fiber desorption.

Assemblies contain 24 gauge needles. 23 gauge and other coatings available as custom.

Recovery of Pesticides Extracted/Stored in SPME Field Sampler is Much Higher than for Stored Water Samples

	–% Loss on Storage[1]–			–% Loss on Storage–	
Analyte	SPME Stored Fiber[2]	SPME Stored Water[3]	Analyte	SPME Stored Fiber	SPME Stored Water
Atrazine	-15	-57	Methoxychlor	-14	-88
DDE	-12	-98	Methyl parathion	-7	-68
Disulfoton	-8	-93	Parathion	-15	-83
Endrin ketone	-10	-82	Phorate	-3	-84
Famphur	-3	-60	Simazine	-10	-53
Heptachlor epoxide	-12	-83	Sulfotep	+4	-81
Lindane	-2	-74	TEPP	-8	-54
Malathion	-6	-74	Thionazin	-3	-68
			Mean	-8%	-75%

[1]Relative to immediate analysis. 10 ppb each pesticide in water.
[2]Pesticides extracted by SPME and stored on PDMS fiber (24 hours/4 °C).
[3]Water sample stored in a silanized vial (24 hours/4 °C), then extracted by SPME.

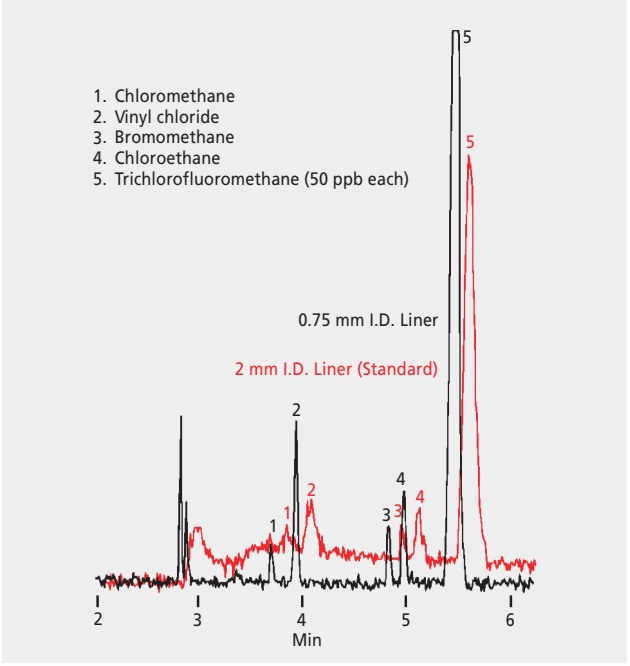
	Cat. No.	Qty
SPME Portable Field Sampler		
100 µm polydimethylsiloxane	504823	2 ea
75 µm Carboxen/polydimethylsiloxane	504831	2 ea
65 µm PDMS/DVB StableFlex fiber	57359-U	2 ea
Thermogreen® LB-2 Septa, solid discs		
diam. 5.0 mm ($^3/_{16}$ in.)	20638	50 ea
SPME Septum Removing Tool		
For Portable Field Sampler	504858	1 ea

SPME-GC Inlet Liners

Achieve Sharper Peak with SPME-GC Analyses, Using Supelco Inlet Liners

GC injection port liners are designed for optimum sample introduction for specific injection techniques. When using SPME, a 0.75 mm I.D. inlet liner increases linear velocity, compared to a conventional, larger volume 2 mm I. D. liner, and rapidly introduces analytes onto the column in a narrow band. The sharp peaks obtained with the 0.75 mm I.D. liner also demonstrate that the compounds are rapidly desorbed from the fiber (Figure A). To minimize sample loss or peak tailing, the inlet liner must be inert. Our proprietary, high-temperature silanization technique thoroughly deactivates Supelco inlet liners to minimize adsorption of active sample components. Using the appropriate inlet liner, combined with efficient, solvent-free sample introduction by SPME, helps to achieve excellent chromatography.

Figure A. Narrow bore inlet liners make SPME/GC peaks sharper.



SPME fiber:	PDMS, 10 µm (57300-U)
column:	VOCOL, 60 m × 0.25 mm I.D. × 1.5 µm (24154)
oven:	35 °C
inj.	230 °C
carrier gas:	helium, 40 cm/sec

SPME-GC Inlet Liners

For Agilent (5890, 6890, and 7890)

For Agilent (5890, 6890, and 7890)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 78.5 mm × 6.5 mm × 0.75 mm

Cat. No.	Qty
2637501	1 ea
2637505	5 ea
2637525	25 ea

For Finnigan (9001GCQ)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 78.5 mm × 6.5 mm × 0.75 mm

Cat. No.	Qty
2637501	1 ea
2637505	5 ea
2637525	25 ea

For PerkinElmer® (AutoSystem)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 92 mm × 6.35 mm × 0.75 mm

Cat. No.	Qty
2631205	5 ea

For Shimadzu™ (9A, 15A, and 16) [with SPL-G9/15 Injector]

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 127 mm × 5.0 mm × 0.75 mm

Cat. No.	Qty
2632901	1 ea
2632905	5 ea

For Shimadzu™ (14, 15A, and 16) [with SPL-14 Injector]

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 99 mm × 5.0 mm × 0.75 mm

Cat. No.	Qty
2633501	1 ea
2633505	5 ea

For Shimadzu™ (17A) [with SPL-17 Injector]

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

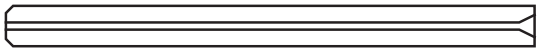
L × O.D. × I.D. ..... 95 mm × 5.0 mm × 0.75 mm

Cat. No.	Qty
2633901	1 ea
2633905	5 ea
2633925	25 ea

For Thermo (ThermoQuest 8000 and TRACE)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 105 mm × 8.0 mm × 0.8 mm



Cat. No.	Qty
2876601-U	1 ea
2876605-U	5 ea

SPME-GC Inlet Liners

For Varian® (1075 and 1077 Injector)

For Varian® (1075 and 1077 Injector)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 74 mm × 6.35 mm × 0.75 mm

Cat. No.	Qty
2635801	1 ea
2635805	5 ea
2635825	25 ea

For Varian® (1078 and 1079 Injector)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 54 mm × 5.0 mm × 0.8 mm

Cat. No.	Qty
2637801	1 ea
2637805	5 ea

For Varian® (1093-94 Injector)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 54 mm × 4.6 mm × 0.8 mm

Cat. No.	Qty
2636401	1 ea
2636405	5 ea
2636425	25 ea

For Varian® (CP-1177 Injector)

Inlet Liner, Direct (SPME) Type, Straight Design (unpacked)

L × O.D. × I.D. ..... 78.5 mm × 6.5 mm × 0.75 mm

Cat. No.	Qty
2637501	1 ea
2637505	5 ea
2637525	25 ea

SPME Accessories

SPME Sampling Stand

Holds vials while supporting the SPME syringe for consistent fiber immersion depth. Cat. No. 57333-U accommodates 4 mL vials only; Cat. No. 57357-U accommodates 15 mL vials. Order the 15 mL vial puck (Cat. No. 57358-U) as a replacement for the 15 mL unit, or to use 15 mL vials with the 4 mL unit. Not for use with automated / HPLC fiber holders.

Description	Cat. No.	Qty
SPME Sampling Stand, for use with 4 mL vials	57333-U	1 ea
SPME Sampling Stand, for use with 15 mL vials	57357-U	1 ea
Heater block for 28 mm diameter vials, for use with 28 mm diameter vials	33313-U	1 ea
15 mL vial puck, made to hold 8 × 15 mL vials	57358-U	1 ea
Thermometer, L 5 in., -10-110 °C	57332	1 ea
Spinbar® magnetic stirring fleas, blue, L 10 mm × diam. 3 mm	Z118877-3EA	3 ea
SPME sampling stand holder & rod assembly, for use with SPME Sampling Stand	57364-U	1 ea

SPME Accessories

Corning® hotplate and stirrer with digital display

- Digital LED temperature display is adjustable in 5 °C increments and blinks until set temperature is reached
- Microprocessor maintains consistent and repeatable temperature and stir speed settings.
- Bright LED HOT TOP icon lights up when top plate temperature is over 60 °C, even when heat control is turned off.
- Separate temperature sensor provides power cut off if unit overheats
- Extremely durable and heat resistant Pyroceram glass-ceramic top
- Small footprint and low profile
- Meets UL and cUL standards

speed ..... 60-1150 rpm
temp. range ..... 5-550 °C

120 V, US 3-pin plug, plate L 5 in. × W 7 in.
product of Corning, Inc., 6795-420D
not available in EU

CLS6795420D-1EA	1 ea

Merlin Microseal™ System (fits Agilent)

Simply place the septum directly onto the septum cup and then add the nut (an additional adapter for the septum cup is not required for Agilent GCs). The septum incorporates a unique design with two sequential seals to provide a much longer life. Order replacement septa, or alternate versions, separately. Compatile with all Agilent autosamplers and stainless steel injection ports.

Note: Do not use with beveled tips.

Left: Septum; Right: Nut

Description	Cat. No.	Qty
1 nut and 1 Low Pressure (1-45 psi) septum	22584	1 ea
1 nut and 2 Low Pressure (1-45 psi) septa	22581-U	1 ea
1 nut and 1 General Purpose (3-100 psi) septum	24815-U	1 ea
1 nut and 2 General Purpose (3-100 psi) septa	24814-U	1 ea
1 nut	22582	1 ea

Merlin Microseal™ System (fits Varian®)

Varian GCs require an inlet adapter and an o-ring in addition to the septum and nut. The septum incorporates a unique design with two sequential seals to provide a much longer life. Order replacement septa, or alternate versions, separately. Not compatible with the Varian 8200 autosampler.

Note: Do not use with beveled tips.

Description	Cat. No.	Qty
For 1079 injector; 1 nut, 1 inlet adapter, 1 o-ring, and 1 General Purpose (3-100 psi) septum	24817-U	1 ea
For CP-1177 injector; 1 nut, 1 inlet adapter, 1 o-ring, and 1 General Purpose (3-100 psi) septum	22609-U	1 kit

Merlin Microseal™ System Replacement Septum

Three septa versions are available:

- **Low Pressure** for use with 23 gauge syringe needles, and injection port pressures between 1 and 45 psi. Do not use with syringe needles that have beveled tips.
- **General Purpose** for use with 23 gauge syringe needles, and injection port pressures between 3 and 100 psi. Do not use with syringe needles that have beveled tips.
- **SPME** for use with 23 gauge SPME fiber assemblies. Do not use with SPME fiber assemblies that have beveled tips.

Note: Do not use with beveled tips.

Description	Cat. No.	Qty
1 Low Pressure (1-45 psi) septum	22583	1 ea
1 General Purpose (3-100 psi) septum	24816-U	1 ea
1 SPME septum	24818-U	1 ea

Molded Thermogreen® LB-2 Septa, with injection hole

The injection hole helps guide the syringe needle to puncture the same location every injection, resulting in two benefits:

- Minimal coring leading to long life
- Less septum fragments that contaminate the inlet liner

Their high puncture tolerance makes these septa ideal for use with autosampler injections, manual injections, and/or SPME applications.

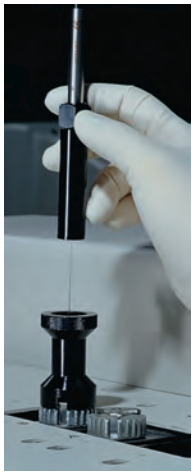
Diam. (mm)	Cat. No.	Qty
9.5	28331-U	50 ea
9.5	28332-U	250 ea
10	28333-U	50 ea
10	28334-U	250 ea
11	28336-U	50 ea
11	28338-U	250 ea
11.5	29446-U	50 ea
11.5	29448-U	250 ea
17	29452-U	50 ea
17	29453-U	250 ea

SPME Accessories

SPME inlet guide

Secures the SPME fiber holder in the injection port during the thermal desorption process. Interchangeable among Merlin Microseal sealing system and most Varian and Agilent chromatographs.

57356-U



SPME Inlet Guide

57356-U	1 ea

Vials for SPME sampling stand

	Cat. No.	Qty
Vials, screw top, amber glass (vial only)		
4 mL, amber glass vial, O.D. 15 mm × H 45 mm ( ) × I.D. 8 mm, thread, 13-425	27115-U 27032	100 ea 1000 ea
Vials, screw top with phenolic open-top cap, pre-assembled		
15 mL, clear glass, O.D. 21 mm × H 70 mm, tan PTFE/silicone septum	27159	100 ea
4 mL, amber glass, O.D. 15 mm × H 45 mm, tan PTFE/silicone septum	27006	100 ea
15 mL, amber glass, O.D. 21 mm × H 70 mm, tan PTFE/silicone septum	27008	100 ea
4 mL, clear glass, O.D. 15 mm × H 45 mm, tan PTFE/silicone septum	27136	100 ea
Septa, white PTFE/silicone		
white PTFE/silicone, diam. 11 mm × thickness 0.075 in., for use with 4 mL vial	27356 27369-U	100 ea 1000 ea
Septa, Viton®		
black Viton®, diam. 11 mm × thickness 0.060 in., for use with 4 mL vial	27351	100 ea

SPME Accessories

Vials, caps, and septa for Varian® 8200 autosampler

	Cat. No.	Qty
Vials, screw top with black polypropylene hole cap (10-425 thread), large opening, pre-assembled		
2 mL, clear glass, red PTFE/silicone, black polypropylene cap, thread: 10-425	27531	100 ea
2 mL, amber glass, red PTFE/silicone, black polypropylene cap, thread: 10-425	27532	100 ea
Septa, PTFE/Silicone		
blue PTFE/white silicone, O.D. 20 mm × thickness 0.75 mm	27539	100 ea
Vials, crimp top, for Thin Seal		
volume 10 mL, clear glass (Thin seal vial for thin septa), O.D. 24.5 mm × H 50 mm × I.D. 12.7 mm, crimp top (0.125 in. thick) for thin septa	27385 27386	36 ea 144 ea
Crimp seals with Viton® septa		
silver aluminum seal, open center (8 mm center hole), diam. 20 mm × thickness 0.76 mm, black Viton® septum, septum thickness 0.75 mm	33146-U 27245 28298-U 27246	36 ea 100 ea 288 ea 1000 ea

Headspace vials for CTC autosampler

	Cat. No.	Qty
Hand crimper, adjustable		
Hand crimper, adjustable, for use with 20 mm crimp seals	22316-U	1 ea
Headspace vial, screw top, rounded bottom (vial only)		
10 mL, clear glass, thread: 18, O.D. 22.5 mm × H 46 mm	SU860099	100 ea
10 mL, amber glass, thread: 18, O.D. 22.5 mm × H 46 mm	SU860100	100 ea
20 mL, clear glass, thread: 18, O.D. 22.5 mm × H 75.5 mm	SU860097	100 ea
20 mL, amber glass, thread: 18, O.D. 22.5 mm × H 75.5 mm	SU860098	100 ea
Magnetic Screw Cap for Headspace Vials		
stainless steel screw cap (magnetic, open-top (8 mm center hole)), thread, 18, PTFE/silicone septum (white PTFE/tranparent blue silicone), septum thickness 1.3 mm	SU860101	100 ea
stainless steel screw cap (magnetic, open-top (8 mm center hole)), thread, 18, PTFE/silicone septum (white PTFE/blue silicone), septum thickness 1.5 mm	SU860103	100 ea
Vials, crimp top, for Thin Seal		
20 mL, clear glass (flat top), crimp top (0.125 in. thick) for thin septa, O. D. 22.5 mm × H 75.5 mm	SU860104	100 ea
Crimp seals with Viton® septa		
gold seal (magnetic with 8 mm center hole), black Viton® septum, diam. 20 mm × thickness 1.0 mm	SU860106	100 ea

Vials for 40 mL Heating Block

	Cat. No.	Qty
Vials, screw top, amber glass (vial only)		
40 mL, amber glass, O.D. 29 mm × H 82 mm × I.D. 17 mm, thread, 24-400	27185-U	100 ea
Vials, screw top with phenolic open-top cap, pre-assembled		
40 mL, clear glass, O.D. 29 mm × H 82 mm, tan PTFE/silicone septum	27180	100 ea
40 mL, amber glass, O.D. 29 mm × H 82 mm, tan PTFE/silicone septum	27010-U	100 ea
Septa, tan PTFE/silicone		
white tan PTFE/silicone, diam. 22 mm × thickness 0.100 in., for use with 20, 40 or 60 mL vial	27188-U	100 ea
Septa, Viton®		
black Viton®, diam. 22 mm × thickness 0.060 in., for use with 20, 40, or 60 mL vial	27355	100 ea

SPME Accessories

Related Information

No.	Title
Biochemical/Food and Beverage	
T195869	*Solid Phase Microextraction: Solventless Sample Preparation for Monitoring Flavor Compounds by Capillary Gas Chromatography (AYM)*
T196901	*Solid Phase Microextraction/Capillary GC Analysis of Drugs, Alcohols, and Organic Solvents in Biological Fluids (AYY)*
T396110	*SPME Reduces Extraction Time in HPLC Analysis of Food Antioxidants and Preservatives*
T397140	*Analysis of Fat Soluble Vitamins from Tablets, Using SPME/HPLC (BKK)*
T398147	*Solid Phase Microextraction of Odors in Drinking Water, for Analysis by GC/MS (BRG)*
Pharmaceutical	
T394062	*Monitor Organic Volatile Impurities (OVIs) in Pharmaceutical Products, Using Solid Phase Microextraction/Capillary GC (AQX)*
Forensic	
T196901	*Solid Phase Micrextraction/Capillary GC Analysis of Drugs, Alcohols, and Organic Solvents in Biological Fluids (AYY)*
T198922	*SPME/GC for Forensic Applications: Explosives, Fire Debris, and Drugs of Abuse (BQS)*
T349061	*Solid Phase Microextraction/Capillary GC: Rapid, Sensitive Detection of Gasoline in Fire Debris (AQW)*
T396098	*SPME/HPLC Interface Combines Fast Sample Extraction with Efficient Analysis for Explosives (ASE)*
Environmental	
T394011	*Solid Phase Microextraction of Volatile Compounds in US EPA Method 524.4 (AOM)*
T394017	*Polyacrylate Film Fiber for Solid Phase Microextraction of Polar Semivolatiles from Water (AOS)*
T394056	*Fast Analysis of Volatile Organic Compounds by Solid Phase Microextraction/Capillary GC (AQL)*
T394058	*Fast Screening for Chlorinated Pesticides by Solid Phase Microextraction/Capillary GC (AQN)*
T395081	*Monitor BTEX Compounds and Fuels in Water, Using Solid Phase Microextraction and Capillary GC (ARO)*
T395085	*Solid Phase Microextraction/Capillary GC Analysis of Nitrogen-Containing Herbicides in Water (ARS)*
T396094	*Solid Phase Microextraction of Organiophosphate Insecticides and Analysis by Capillary GC/MS (ASB)*
T396099	*SPME/HPLC: A Rapid and Sensitive Analysis of Polynuclear Aromatic Hydrocarbons in Water (ASF)*
T396106	*Analysis of Surfactants in Water by SPME/HPLC*
T397121	*Solid Phase Microextraction for HPLC Analysis of Carbamate and Urea Pesticides (BGU)*
T397141	*Air Sampling of VOCs Using SPME for Analysis by Capillary GC (BKF)*
T397143	*Field Sampling for Pesticides, Using Solid Phase Microextraction/Capillary GC (BJT)*
T398147	*Solid Phase Microextraction of Odors in Drinking Water, for Analysis by GC/MS (BRG)*
Lab Hints and Selection Guides	
T101928	*SPME Troubleshooting Guide*
T101929	*A Practical Guide to Quantitation with SPME*
T198923	*Solid Phase Microextraction: Theory and Optimization of Conditions*
T199925	*SPME Applications CD-ROM*
T396098	*SPME/HPLC Interface Combines Fast Sample Extraction with Efficient Analysis for Explosives (ASE)*
T496037	*Solid Phase Microextraction Sampling Stand (AWS)*
T496049	*SPME/HPLC Interface (AWV)*
T497105	*SPME Portable Field Sampler with Carboxen/PDMS Fiber (BIZ)*
T497174	*SPME Portable Field Sampler with 100 mm PDMS Fiber (BKL)*

Visit sigma-aldrich.com/spme
Our website features complete information about SPME, including product descriptions, applications, and answers to common questions.
Contact us at techservice@sial.com
Our knowledgeable research and development chemists will answer any questions you have about SPME.