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Product Information

SPME Metal Fiber Assemblies

P001064

Solid Phase Microextraction (SPME) has grown significantly over the last 10 years. The CTC CombiPAL™ is a valuable tool for high volume sample analysis using SPME. However the sample agitator on the CombiPAL, which increases sample adsorption efficiency, can significantly stress the fiber leading to fiber damage and shorter fiber life.

A new SPME fiber assembly has been developed that contains a special metal alloy in the needle, plunger, and fiber core. This metal alloy adds significantly greater strength, resulting in up to 10 times longer fiber assembly life. This new material also allowed us to improve the fiber manufacturing process, resulting in better inter and intra-lot reproducibility leading to greater overall reproducibility in analytical results. While some customers may be concerned that certain analytes might breakdown by contact with metal in a hot injection port, we have demonstrated that this new metal alloy is equally inert when compared to existing fused silica and StableFlex™ fiber assemblies.

Table 1. Comparison of Metal vs. Standard Fiber Assembly Components

	Metal SPME Fiber	Standard SPME Fiber
Needle	23 gauge metal alloy Beveled tip	24 or 23 gauge SS Blunt tip
Fiber Core	Metal alloy	Fused silica or StableFlex
Plunger	Solid metal alloy	Stainless steel tubing

The increased assembly life results from a fiber assembly made of individual components such as the plunger, needle, and fiber core that utilize this special metal alloy (see Table 1). In a side-by-side evaluation, 5 out of 5 of the metal assemblies were able to perform a minimum of 350 extraction/desorption cycles without breaking compared to 30-40 cycles for the previous silica based fibers with stainless steel assemblies under the same conditions.

Table 2. Comparison of Physical Durablity and Coating Life of Metal and Standard SPME Fibers

	Metal SPME Fiber	Standard SPME Fiber
Assembly Physical Durability	> 360 cycles	30-40 cycles
Fiber coating	120-200 cycles	30-40 cycles*

*Fiber coating life is constrained by the physical durability of the fiber assembly. Once the fiber assembly is damaged it is impossible to further test the coating durability.

While the physical durability has improved significantly, the limitation of the overall fiber life shifts to the fiber coating which is heavily dependent on coating type, sample matrix, and extraction/desorption conditions. Certain coatings, such as the adsorbent coatings, are not as durable as the absorbent coatings. Likewise certain sample matrices can affect fiber life by containing components that irreversibly bind to the fiber coating or physically degrade the coating. Lastly high temperatures and long desorption cycles can also affect the overall coating durability.

Using the metal alloy as the fiber core material also allowed us to optimize the fiber coating process. The new continuous process that was developed controls many variables that affect fiber reproducibility. Carboxen™-PDMS fibers have been particularly difficult to coat reproducibly due to many variables that can affect these fibers. Table 3 shows the comparison of lots of Carboxen-PDMS fibers prepared with the old and new coating process. As the results show, the relative standard deviation of the assemblies made by the new process have less than half the variation compared to those made by the older process.

Table 3. Response and Relative Standard Deviation of Old vs. New Process

	Ethane	Propane	Butane	Pentane	Hexane
Old Process (n=8)					
Avg Response	125	1699	6462	12371	16224
Std Deviation	206	01.1	1777.9	2045.1	2243.2
% RSD	16%	35%	28%	17%	14%
New Process (n=6)					
Avg Response	202	3375	11083	16233	19294
Std Deviation	16.1	328.3	513.4	789.7	974.7
% RSD	8%	10%	5%	5%	5%

Another significant advantage of the metal alloy is that it is a very inert metal that does not contain any iron. None of the components in the assembly exposed to the heated injection port contain iron. Thus analytes that may breakdown by contact with metal in a hot injection port are not an issue with this assembly. To verify the inertness of the fiber, a sample containing amines was extracted with the various fiber core types and compared to each other. It is generally understood that small amines can react with metals and breakdown.

The results of our evaluation (Table 4) indicate that the response using the fibers with metal alloy cores were similar to those with the fused silica and StableFlex cores.

Table 4. Relative Response of Amines on 3 Fiber Core Materials

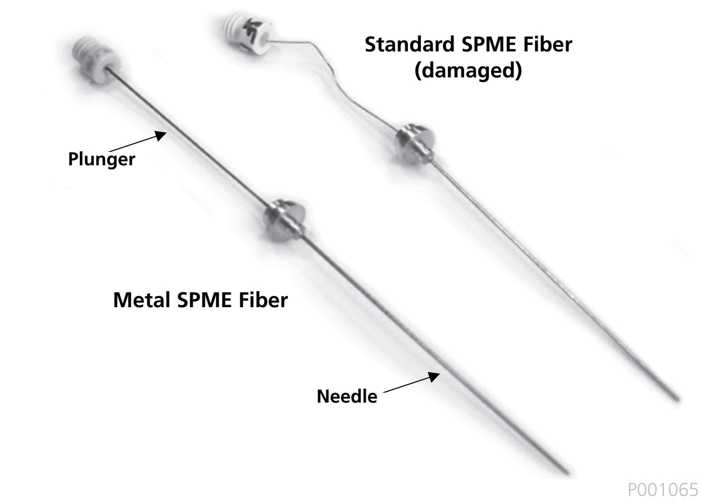
	Methylamine		Dimethylamine		Diethylamine	
Fiber Core	Ratio%	RSD	Ratio%	RSD	Ratio	% RSD
Metal	1.14	5.8	4.85	4.7	38.12	3.4
Fused Silica	1.02	6.6	4.21	4.4	38.67	2.9
StableFlex	1.04	6.7	5.43	6.2	37.49	3.6

The merging of a new fiber assembly with a metal fiber core and an improved coating process has created a superior SPME fiber assembly ideal for autosampler applications. Customers should not only enjoy longer assembly life, but better reproducibility between fibers.

The SPME metal fiber assemblies are different than the standard SPME assemblies and careful attention needs to be taken to insure that they function properly and maintain their durability and life. The following 3 notes are very important when working with the metal fiber assemblies:

- When using the metal fibers, it is important to adjust the fiber home position so that the fibers are not damaged during processing
- Do not condition the fibers for longer than 2 hours at one time or the elastic properties of the metal alloy may be destroyed.
- The metal fiber assemblies must be used with the Merlin Microseal™ to eliminate septum coring due to the larger needle bore and beveled tip.

Figure A. New Metal SPME Fiber vs. a Damaged Standard SPME Fiber Assembly



Ordering Information:

Description	Cat. No.
7 µm PDMS	**57919-U**
30 µm PDMS	**57922-U**
100 µm PDMS	**57928-U**
65 µm PDMS/DVB	**57902-U**
50/30 µm DVB/Carboxen/PDMS (2 cm)	**57914-U**
50/30 µm DVB/Carboxen/PDMS (1 cm)	**57912-U**
85 µm Carboxen/PDMS	**57906-U**

Supelco's 6th Edition SPME Applications CD is now available with new SPME Video Demonstrations

The CD includes:

- Over 2200 application references for SPME
- Short video demonstrations of SPME basics
- Comprehensive list of SPME literature

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CombiPAL – CTC Analytics
Carboxen, StableFlex – Sigma-Aldrich Co.
Microseal – Merlin Instrument Company

Patent

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