

Stable Sulfur & Mercury Sampling in Refineries

Using Siltek® and Sulfinert® Surface Treated Components

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- Reliably sample sulfur and mercury compounds at ppb levels.
- Reduce lab costs—obtain accurate results the first time.
- Detect costly process upsets, improving product yield.

Refinery and natural gas samples often contain trace amounts of sulfur- and mercury-containing compounds, which can interfere with reactions, poison catalysts in petrochemical processes, and damage equipment. Because these compounds quickly react with stainless steel surfaces, accurate determination of these compounds is impossible when samples are collected and stored in untreated sample cylinders. Restek's Siltek® and Sulfinert® passivation techniques bond an inert layer into the surface of stainless steel, preventing active compounds from reacting with or adsorbing to the steel.

Accurate sulfur sampling

To characterize Sulfinert® surfaces, we tested the stability of 17ppbv standards of sulfur compounds in three Sulfinert® sample cylinders over a 54-hour period. Dimethyl sulfide, which is not adsorbed by stainless steel, was used as an internal standard. The Sulfinert®-treated cylinders were inert to the reactive sulfur compounds over the 54-hour test period (Figure 1). Hydrogen sulfide exhibited greater than 85% recovery; methyl mercaptan, ethyl mercaptan, carbonyl sulfide, and dimethyl disulfide exhibited greater than 90% recovery.

Sulfinert®-treated gas sampling equipment is ideal for collecting and storing samples containing ppb levels of sulfur compounds, such as natural gas or beverage-grade carbon dioxide. Sulfinert® treatment ensures that sulfur compounds or other highly active compounds remain stable during transport from the field to the laboratory.

Stable Mercury Results

Siltek® surface treatment has been used in a wide variety of applications in which an inert surface is of paramount importance. To measure the impact of Siltek® treatment on adsorption of mercury during storage, we compared the performances of 304 grade stainless steel gas sampling cylinders (Swagelok®, Solon OH) with and without Siltek® treatment.

We filled each cylinder with $8\mu\text{g}/\text{m}^3$ of elemental mercury (approximately 1 part per billion) (Spectra Gases, Alpha NJ) and assessed the mercury concentration in each cylinder over time to determine changes in mercury concentration. Detection was achieved by direct interface gas sampling to an atomic absorption detector. The sample pathway regulator and tubing were Siltek® treated to ensure accurate transfer.

The data in Figure 2 demonstrate that Siltek® treatment provides a stable surface for elemental mercury, and untreated stainless steel does not. Based on these results, we conclude that Siltek® surface treatment for steel or stainless steel components and tubing in CMMS and sorbent tube mercury sampling systems will improve analytical reliability.

Siltek® and Sulfinert® surface treated cylinders and sampling components provide an inert sample path, which prevents adsorption of active compounds and ensures accurate sampling. For more information about these treatments, visit us at www.restekcoatings.com.

Acknowledgement

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Figure 1 Stability of sulfur compounds is remarkable in Sulfinert®-treated cylinders.

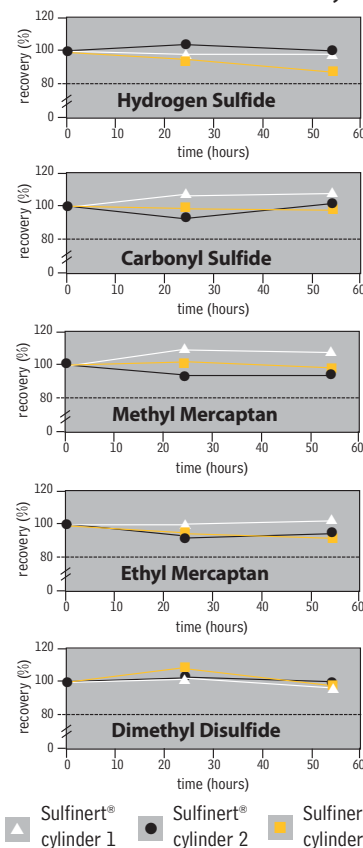
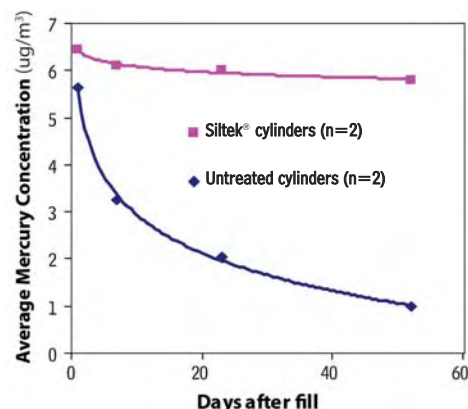


Figure 2 Siltek® treated gas sampling cylinders show very good inertness toward mercury.



Sulfinert® Treated Swagelok® Sample Cylinders

- Stable storage of samples containing ppb levels of sulfur compounds.
- Manufactured by Swagelok®; U.S. D.O.T. rated to 1,800psi (12,411kPa) at room temperature.
- 304 grade stainless steel with 1/4" female NPT threads on both ends.

Description	Size	qty.	cat.#
Sulfinert® Sample Cylinder	75cc	ea.	24130
Sulfinert® Sample Cylinder	150cc	ea.	24131
Sulfinert® Sample Cylinder	300cc	ea.	24132
Sulfinert® Sample Cylinder	500cc	ea.	24133
Sulfinert® Sample Cylinder	1000cc	ea.	24134
Sulfinert® Sample Cylinder	2250cc	ea.	21394

**Sulfinert® Treated Alta-Robbins Sample Cylinder Valves**

- All wetted parts are Sulfinert® treated for inertness.
- Compatible with Sulfinert® treated Swagelok® sample cylinders.
- Large, durable, Kel-F® seat ensures leak-free operation; temperature range: -40°C to 120°C.

Description	qty.	cat.#
1/4" NPT Exit	ea.	21400
1/4" Compression Exit	ea.	21401
1/4" NPT with Dip Tube*	ea.	21402
1/4" NPT with 2850psi Rupture Disc	ea.	21403
1/4" NPT Male Inlet x 1/4" Female Outlet with 2850psi Rupture Disc	ea.	21404

*To order catalog #21402 (Sulfinert Alta-Robbins Sample Cylinder Valve, 1/4" NPT with Dip Tube), please call Customer Service at 800-356-1688, ext. 3, or contact your Restek representative. Specify dip tube length or % outage when ordering (maximum length = 5.25" / 13.3cm). Note: End of part will not be treated after cutting tube to length.

**Siltek®/Sulfinert® Treated Coiled Electropolished 316L Grade Stainless Steel Tubing**

Recommended for:

- high temperatures
- demanding/corrosive environments
- ultimate inertness

OD	ID	cat.#	5-24 ft.	25-99 ft.	100-299 ft.	>300 ft.
1/8" (3.18mm)*	0.085" (2.16mm)	22538				
1/4" (6.35mm)**	0.180" (4.57mm)	22539				

Siltek®/Sulfinert® Treated Coiled 316L Grade Stainless Steel Tubing

Recommended for:

- inert applications
- high temperatures
- high pressures
- corrosive environments

OD	ID	cat.#	5-24 ft.	25-199 ft.	200-399 ft.	>400 ft.
1/8" (3.18mm)**	0.055" (1.40mm)	22508				
1/4" (6.35mm)**	0.180" (4.57mm)	22509				
3/8" (9.52mm)***	0.277" (7.04mm)	22914				

Siltek®/Sulfinert® Treated Straight Seamless 316L Grade Stainless Steel Tubing

- Individual 6-foot pieces.

6 foot Length

OD	ID	qty.	cat.#
1/8" (3.18mm)**	0.055" (1.40mm)	ea.	22901
1/4" (6.35mm)**	0.180" (4.57mm)	ea.	22902
3/8" (9.52mm)***	0.277" (7.04mm)	ea.	22903

1/8" OD: 5 ft. to 100 ft. in one continuous coil; 1/4" OD: 5 ft. to 300 ft. in one continuous coil. Longer lengths will be more than one coil. Note: required length in meters x 3.2808 = length in feet.

- *0.020" wall thickness
- **0.035" wall thickness
- ***0.049" wall thickness

ordering note

An extra charge is applied for cutting Siltek®/Sulfinert® or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item