

SIEVERS® 355 SCD™ Sulfur Chemiluminescence Detector

Overview

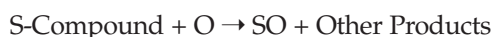
The Sievers 355 Sulfur Chemiluminescence Detector (SCD) is the world's most sensitive and selective chromatographic detector for sulfur containing compounds. The SCD is based upon Sievers' patented technology, and it provides a linear and equimolar response to sulfur compounds without interference from most sample matrices. The exceptional performance of the 355 SCD has resulted in its wide-spread use and acceptance for the analysis of sulfur compounds in gases, petroleum and petrochemical products, polymers, chemicals, foods, beverages, fragrances, pesticides and environmental samples.



Key Features

Patented Technology. The 355 SCD utilizes the combustion of sulfur compounds to form sulfur monoxide (SO) and the subsequent chemiluminescence reaction of SO with ozone (O₃). The unique combustion process achieves high temperatures (>1,800° C) which are unattainable by standard pyrolysis methods. This patented technology allows the 355 SCD to make ultra-sensitive measurements of any sulfur containing compound that can be analyzed by gas chromatography (GC) or supercritical fluid chromatography (SFC).

Reaction Mechanism

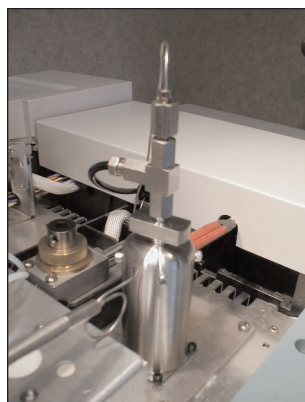


The light (hν) passes through an optical filter and is detected by a photomultiplier tube. This mechanism provides selective sulfur detection which is described in the following US and foreign patents: 5,330,714; 5,227,135; 5,310,683; 5,501,981; 5,424,217; 5,661,032; 6,130,095; WO 95/22049 and patents pending.

FID Adapter. For simultaneous determination of sulfur and hydrocarbon compounds, the 355 SCD may be equipped with a flame ionization detector (FID) adapter. Eluting compounds pass from the chromatographic column into the FID and then directly into the SCD. This eliminates the need to split the column effluent between two detectors operating at different pressures, and the associated problems with that approach (e.g., discrimination, loss of analytes, degradation of chromatographic performance, etc.) FID adapters are available for all GC's made by major manufacturers.

Decoking Valve. While not necessary for most chromatographic applications, a decoking valve is available to prevent the accumulation of carbon in the burner. This is important for applications in which there is a tendency for the sample to polymerize and form carbon deposits in the burner, e.g., dienes, or when large quantities of hydrocarbons are introduced into the chromatograph (> 1x 10⁻⁴ g/sec).



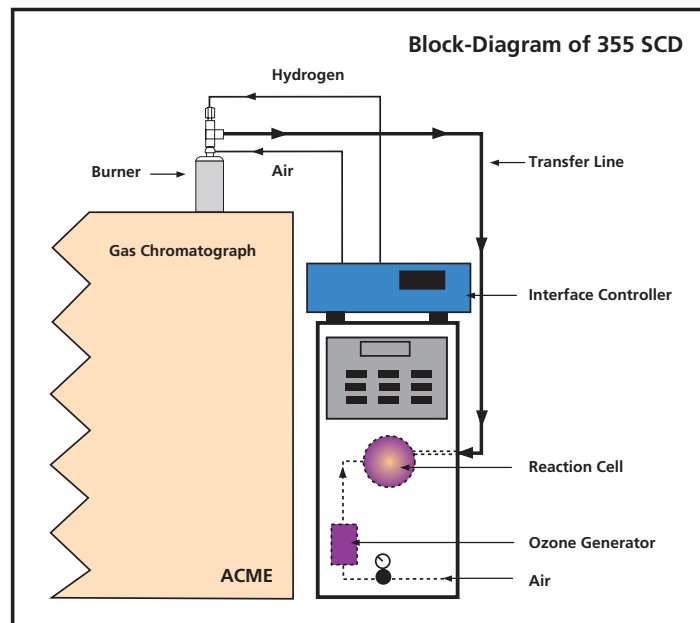


Stainless Steel Burner

Stainless Steel Burner. The stainless steel burner provides for direct connection of the column to the burner, eliminating peak-tailing and the possibility of unswept dead volumes. The compact stainless steel burner advances the established technology by improving chromatography, reducing maintenance, and enhancing ease-of-use. Combustion tubes may be easily accessed from the top of the burner without disassembly. The small size of the burner (~6 inches, 15 cm) facilitates direct mounting into a detector port on most gas chromatographs.

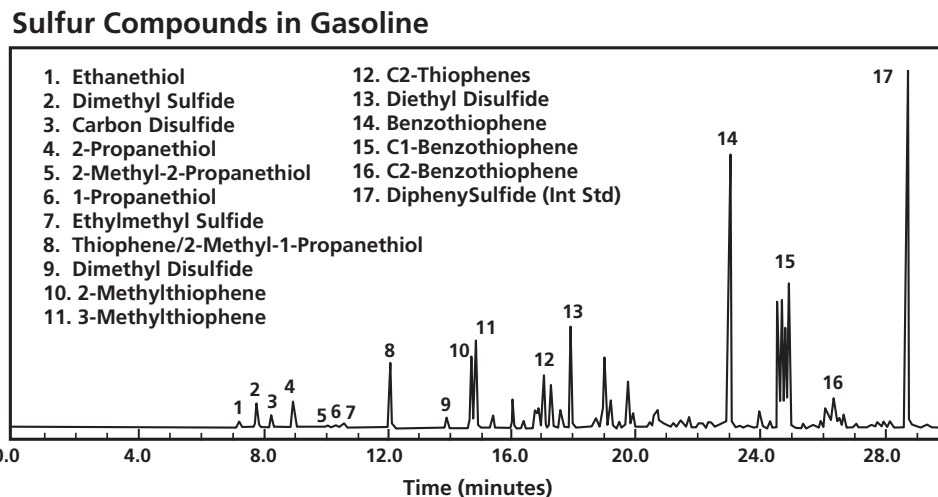
Method Approval. The 355 SCD is the detector of choice for ASTM Standard Test Method D

5504: *Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Chemiluminescence*, and ASTM D 5623: *Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selection Detection*. The SCD is the only detector tested for ASTM D 5623-95 in which data was sufficient for determining method precision. (ASTM Research Report: RR:D02-1335).



Applications

Natural Gas, Petroleum and Petrochemical Products. Gas chromatography with sulfur chemiluminescence detection provides a rapid means of identification and quantitation of sulfur compounds in petroleum feeds and products. Examples include the analysis of sulfur compounds in monomers such as ethylene and propylene; solvents such as paraffins, benzene, toluene and xylenes; and fuels such as natural gas, LPG, gasoline, kerosene, jet and diesel fuels. Analysis of sulfur compounds in gasoline is illustrated below.

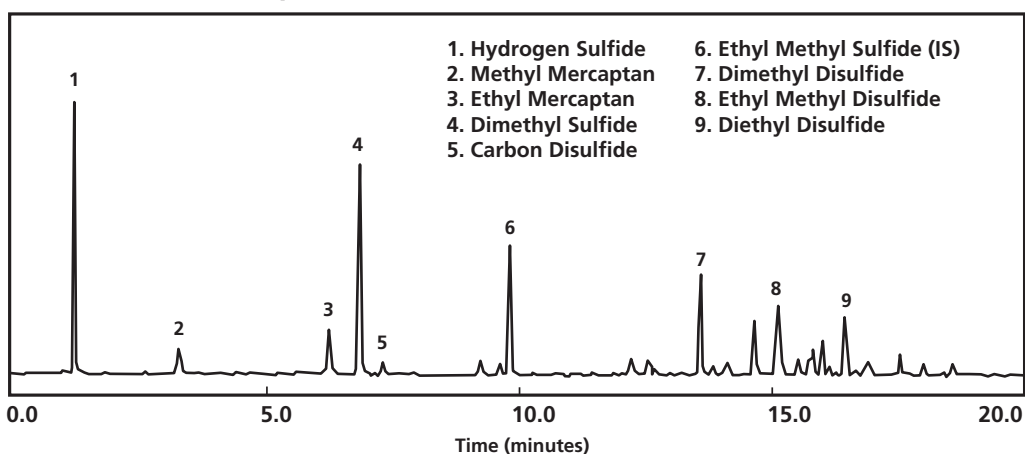


Chromatogram represents approximately 85 ppm wt. total sulfur.

355 SCD Applications

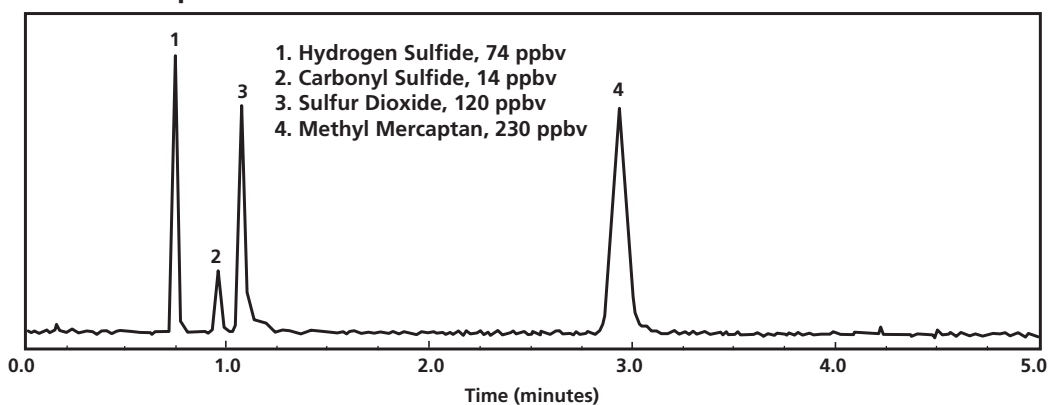
Food and Beverage Products. Sulfur compounds possess extremely low odor and taste thresholds, making them very important in flavor and fragrance chemistry. The SCD is the detector of choice for analysis of sulfur compounds which affect product odor and flavor because of its sensitive and selective detection. As an example, sulfur chemiluminescence detection is useful for identification and quantitation of sulfur compounds in beer as shown below.

Volatile Sulfur Compounds in Beer



Gaseous Sulfur Emissions. The reliable measurement of atmospheric sulfur gases is important because these compounds are notorious for their foul odors when present at only part per billion levels and may be toxic at higher levels. There are numerous natural and industrial sources of sulfur gases. Natural sources of emission include: animals, vegetation, soils and volcanoes. Industrial sources include: refineries, smelters, kraft paper pulpers, food processors and power generators. The chromatogram (below) illustrates the ability of the SCD to speciate and quantitate sulfur compounds at levels less than 1 ppm in an air sample without preconcentration.

Sulfur Compounds in Air



Analytical Specifications

Sensitivity	< 0.5 pg S/sec
Selectivity	> 10 ⁷ g S/g C
Linearity	~10 ⁵
Typical Flow Rates	Air 15-40 mL/min or 6-12 mL/min as oxygen Hydrogen 75-100 mL/min
Output	Analog 0-100 mV, 0-1 V, 0-10 V scalable
Power Requirements	USA 110/115 V 60 Hz Japan 90/100 V 50/60 Hz Europe 220/240 V 50 Hz

Dimensions and Weight

Dimensions	SCD 16 H x 9.2 W x 21.8 L inches (41 x 24 x 55 cm) Oil Sealed Vacuum Pump 9.8 H x 6.3 W x 18.5 L inches (25 x 16 x 47 cm) SCD Burner Controller 4 H x 11 W x 7 L inches (10 x 28 x 18 cm) Oil-Free Vacuum Pump (Optional) 5.8 H x 7.4 W x 9.6 L inches (15 x 19 x 24 cm)
Weight	SCD 34 lbs (11 kg) Oil Sealed Vacuum Pump 45 lbs (20 kg) SCD Burner Controller 8.2 lbs (3.7 kg) Oil-Free Vacuum Pump (Optional) 13.9 lbs (6.3 kg)

Gas Requirements

Air, Hydrogen, Oxygen (optional), All gases should be Ultrahigh-purity (UHP or 99.999%) grade. Sulfur Traps for all gases are highly recommended.**

Precision and Long Term Stability

Repeated injections of a standard with 16 ppm Dimethyl sulfide (DMS) and 28 ppm Thiophene at 30 minute intervals, produced the following results:

For 12 hours of continuous operation: RSD* DMS < 5%; RSD* Thiophene < 5%

For 100 hours of continuous operation: RSD* DMS < 10%; RSD* Thiophene < 10%

On-column injections of 0.2 µl into a 60 m x .53 mm HP-1 column (5 µm film)

Hydrogen flow = 75 cc/min; Air Flow = 15 cc/min

Maintenance Schedule

Change Vacuum Pump Oil	30 days
Replace Oil Filter	90 days
Replace Chemical Trap	30 days
Clean Reaction Cell	6 months

*Relative Standard Deviation

**Sulfur Traps are available from Ionics Instruments



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