



Standard Test Method for Determination of Total Sulfur in Liquid Hydrocarbons and Hydrocarbon-Oxygenate Blends by Gas Chromatography with Flame Photometric Detection¹

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1. Scope*

1.1 This test method covers the determination of total sulfur in liquid hydrocarbons with a final boiling point less than 450 °C by gas chromatography using a flame photometric detector.

1.2 This test method is applicable for total sulfur levels from 0.5 mg S/kg to 100 mg S/kg.

NOTE 1—The pooled limit of quantification (PLOQ) derived from the 2002 interlaboratory cooperative test program was determined to be 1 mgS/kg.

NOTE 2—Samples can also be tested at other total sulfur levels, but the precision statements may not apply.

1.3 The values stated in SI units are to be regarded as standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard statements see Section 7.

2. Referenced Documents

2.1 *ASTM Standards:*²

D1298 Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

D4052 Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

E840 Practice for Using Flame Photometric Detectors in Gas Chromatography

3. Summary of Test Method

3.1 The sample is analyzed by gas chromatography with a flame photometric detector. A fixed amount of sample is injected into the gas chromatograph where it is vaporized. The air carrier stream carries the vaporized sample into a high temperature zone (>900 °C) where the compounds present in the sample are oxidized. Sulfur compounds are converted to sulfur dioxide (SO₂). The carrier stream carries the oxidation components onto a chromatographic column where they are separated and the SO₂ is quantified by the flame photometric detector. Calibration of the detector is achieved by the use of an appropriate external standard.

4. Significance and Use

4.1 This test method can be used to determine total sulfur levels in process feeds and finished products that fall within the scope of this test method.

4.2 Low levels of sulfur in process feed stocks can poison expensive catalysts used in petroleum refining processes. This test method can be used to monitor sulfur levels in these feedstocks.

5. Apparatus

5.1 *Gas Chromatograph*, equipped with automatically controlled valves, capable of automatic calibration with an external standard and having a flame photometric detector with an overall sensitivity to detect at least 0.5 mg/kg of SO₂. It must be able to automatically control all valve switching times. Although originally developed with online analytical measurement equipment in an offline mode of operation, suitable online or laboratory gas chromatographs may apply this test method as described. Typical instrument parameters are listed in Table 1.

5.1.1 *Carrier and Detector Gas Control*—The chromatograph must be equipped with flow controllers or pressure controllers capable of maintaining a constant supply of carrier gas and detector supply gases. Electronic pressure or flow control is highly recommended.

*A Summary of Changes section appears at the end of this standard