



Standard Test Method for Determination of Total Volatile Sulfur in Gaseous Hydrocarbons and Liquefied Petroleum Gases by Ultraviolet Fluorescence¹

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1. Scope

1.1 This test method covers the determination of total volatile sulfur in gaseous hydrocarbons and liquefied petroleum (LP) gases. It is applicable to analysis of natural, processed, and final product materials containing sulfur in the range of 1 to 100 mg/kg (Note 1).

NOTE 1—An estimate of pooled limit of quantification (PLOQ), information regarding sample stability and other general information derived from the inter-laboratory study on precision can be referenced in ASTM research report RR: D02-1506.²

1.2 This test method may not detect sulfur compounds that do not vaporize under the conditions of the test.

1.3 This test method is applicable for total volatile sulfur determination in LP gases containing less than 0.35 % (mass/mass) halogen(s).

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

1.5 *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.* See paragraphs 3.1, 6.3, and Section 7 for specific safety statements.

2. Referenced Documents

2.1 ASTM Standards:

D 1070 Test Methods for Relative Density (Specific Gravity) of Gaseous Fuels³

D 1265 Practice for Sampling Liquefied Petroleum (LP) Gases (Manual Method)⁴

D 3700 Practice for Containing Hydrocarbon Fluid Samples Using a Floating Piston Cylinder⁵

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

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² Available from ASTM Headquarters. Request RR:D02-1506.

³ Annual Book of ASTM Standards, Vol 05.06.

⁴ Annual Book of ASTM Standards, Vol 05.01.

⁵ Annual Book of ASTM Standards, Vol 05.02.

D 5287 Practice for the Automatic Sampling of Gaseous Fuels³

D 6299 Practice for Applying Statistical Quality Assurance Techniques to Evaluate Analytical Measurement System Performance⁶

F 307 Practice for Sampling Pressurized Gas for Gas Analysis⁷

2.2 Gas Processor Association (GPA) Standards:⁸

GPA 2166 Obtaining Natural Gas Samples for Analysis by Gas Chromatography

GPA 2174 Obtaining Liquid Hydrocarbon Samples for Analysis by Gas Chromatography

3. Summary of Test Method

3.1 A heated sample valve is used to inject gaseous samples. Liquefied petroleum gas (LPG) samples are injected by a sample valve connected to a heated expansion chamber. The gaseous sample then enters a high temperature combustion tube where sulfur is oxidized to sulfur dioxide (SO₂) in an oxygen rich atmosphere. Water produced during the sample combustion is removed and the sample combustion gases are next exposed to ultraviolet (UV) light. The SO₂ absorbs the energy from the UV light and is converted to an excited sulfur dioxide (SO₂*). Fluorescence emitted from the excited SO₂* as it returns to a stable state SO₂ is detected by a photomultiplier tube, the resulting signal is a measure of the sulfur contained in the sample. (**Warning**—Exposure to excessive quantities of ultraviolet light is injurious to health. The operator shall avoid exposing their person, especially their eyes, not only to direct UV light but also to secondary or scattered radiation that is present.)

4. Significance and Use

4.1 The sulfur content of LPG, used for fuel purposes, contributes to SO_x emissions and can lead to corrosion in engine and exhaust systems. Some process catalysts used in petroleum and chemical refining can be poisoned by sulfur

⁶ Annual Book of ASTM Standards, Vol 05.03.

⁷ Annual Book of ASTM Standards, Vol 15.03.

⁸ Available from Gas Processors Assoc., 6526 East 60th, Tulsa, OK 74145.

