



Standard Test Method for Analysis of Hydrogen Sulfide in Gaseous Fuels (Lead Acetate Reaction Rate Method)¹

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1. Scope

1.1 This test method covers the determination of hydrogen sulfide (H_2S) in gaseous fuels. It is applicable to the measurement of H_2S in natural gas, liquefied petroleum gas (LPG), substitute natural gas, landfill gas, sewage treatment off gasses, recycle gas, flare gasses, and mixtures of fuel gases. This method can also be used to measure the hydrogen sulfide concentration in carbon dioxide. Air does not interfere. The applicable range is 0.1 to 16 parts per million by volume (ppm/v) (approximately 0.1 to 22 mg/m^3) and may be extended to 100 % H_2S by manual or automatic volumetric dilution.

1.2 *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.*

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

D1914 Practice for Conversion Units and Factors Relating to Sampling and Analysis of Atmospheres

D2420 Test Method for Hydrogen Sulfide in Liquefied Petroleum (LP) Gases (Lead Acetate Method)

D3609 Practice for Calibration Techniques Using Permeation Tubes

D7166 Practice for Total Sulfur Analyzer Based On-line/At-line for Sulfur Content of Gaseous Fuels

E2165 Practice for Establishing an Uncertainty Budget for the Chemical Analysis of Metals, Ores, and Related Materials (Withdrawn 2007)³

¹ This test method is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.05 on Determination of Special Constituents of Gaseous Fuels.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.

3. Summary of Test Method

3.1 Measurement of H_2S is accomplished by ratiometrically comparing a reading of an unknown sample with that of a known standard using a differential colorimetric detection. Pure H_2S is used as a primary standard and mixed volumetrically with a sulfur free matrix gas that is ideally similar in composition to the sample gas. A gaseous sample at constant flow is humidified and passed over lead-acetate-impregnated paper. H_2S reacts with lead acetate to form a brown stain on the paper. The rate of reaction and resulting rate of color change is proportional to the concentration of H_2S in the sample. The analyzer is comprised of an optical system, a photon detection system, a signal differentiation system of first order, and a signal output system. When there is no change in the color of the tape, and no resulting change in photodetector output, E , the first derivative, dE/dt , is zero. This results in an analyzer that automatically zeroes when there is no H_2S .

4. Significance and Use

4.1 This test method is useful in determining the concentration of hydrogen sulfide in gaseous samples and in verifying compliance with operational needs and/or environmental limitations for H_2S content. The automated performance operation of this method allows unattended measurement of H_2S concentration. The user is referred to Practice D7166 for unattended on-line use of instrumentation based upon the lead acetate reaction rate method.

5. Apparatus

5.1 *Volumetric Measuring Devices*—A graduated 10-L cylinder (see Fig. 1) having a movable piston for volumetrically measuring test gas. Gastight syringes of 0.1 and 0.5-mL volume for volumetrically measuring 100 % H_2S . Gas tight syringes of other volumes can be used. These graduated devices are not needed when the permeation tube method of dynamic mixing is used to prepare the reference sample since this method will generate a reference mixture.

5.2 *Sample Pump*—A pump capable of providing more than 8 mL/s (approximately 1 ft^3/h) or less than 1 mL/s at 70 kPa (approximately 10.15 psig). Gas-wetted parts are ideally constructed from either aluminum or polytetrafluorethylene