



Standard Test Method for Hydrogen Sulfide and Mercaptan Sulfur in Natural Gas (Cadmium Sulfate Iodometric Titration Method)¹

This standard is issued under the fixed designation D 2385; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of hydrogen sulfide and mercaptan sulfur in natural gas. It is applicable over the concentration range from 0 to 5 grains of hydrogen sulfide (about 11 mg/m³) and 0 to 1 grain of mercaptan sulfur/100 ft³ (2.832 m³) of natural gas.

1.2 *This standard does not purport to address all of the safety problems, 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 Document

- 2.1 *ASTM Standard:*
D 1193 Specification for Reagent Water²

3. Summary of Test Method

3.1 A measured volume of natural gas is bubbled through neutral cadmium sulfate solution to remove hydrogen sulfide, and then through basic cadmium sulfate to scrub out the mercaptans. The amounts of hydrogen sulfide and mercaptan sulfur in the absorbers are then determined iodometrically.

4. Significance and Use

4.1 Natural gas and its products of combustion must not be unduly corrosive to the materials with which they come in contact and the measure of hydrogen sulfide and other sulfur compounds is important. In addition, in some cases the odor of the gas must not be objectionable and from this standpoint the measurement of mercaptan sulfur is significant.

5. Apparatus

5.1 *Gas Washing Bottle*—A bottle with side inlet, coarse-porosity fritted disk (40 to 60 μ m maximum pore size), and 24/40 outer joint at the outlet. The diameter of the fritted disk is 60 mm, and the approximate outside diameter and height are 70 and 280 mm, respectively.³

5.2 *Spray Traps*, with 20/40 inner joint, for use on the

outlet side of the gas washing bottle.⁴

5.3 *Test Meter*, with dial divisions graduated to 0.01 ft³ (28 cm³) and accurate to 0.5 percent when measuring gas volumes from 2 to 10 ft³ (0.06 to 0.28 m³). The meter should be calibrated before use and should be a type that is usable in the field.

5.4 *Thermometer*, graduated in 1°F (0.5°C) divisions.

5.5 *Aspirator Bulb*, with a short piece of gum rubber tubing attached to the pressure end.

5.6 *Barometer*.

5.7 *Stop Watch*.

5.8 *Tubing and Connections*—Glass, aluminum, or stainless steel is satisfactory. Connections between tubing and apparatus should be made with gum rubber tubing, with a minimum amount of rubber exposed to the gas sample.

6. Reagents and Materials

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁵ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification D 1193.

6.3 *Cadmium Sulfate Solution A*—Dissolve 10 g of cadmium sulfate hydrate (3CdSO₄·8H₂O) (**Danger—Poison**). May be fatal if swallowed or inhaled) in water and dilute to 1 L.

6.4 *Cadmium Sulfate Solution B*—Dissolve 140 g of 3CdSO₄·8H₂O (**Danger—Poison**. May be fatal if swallowed or inhaled. See Annex A1.1) in water and dilute to 1 L.

6.5 *Hydrochloric Acid* (sp gr 1.19)—Concentrated hydrochloric acid (HCl).

6.6 *Iodine Standard Solution* (0.1 N)—Weigh 13.0 g of resublimed iodine into a 250-mL beaker. Add 22 g of potassium iodide (KI) and 100 mL of water. Stir until solution is complete, dilute to 1 L, mix thoroughly, and store in an amber, glass-stoppered bottle. Standardize this solution

¹ This test method is under the jurisdiction of ASTM Committee D-3 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 *Annual Book of ASTM Standards*, Vol 11.01.

³ The bottle available under Corning catalog No. 31750 has been found satisfactory for this purpose.

⁴ The spray trap available under Corning Catalog No. 37723 (specify spray trap only) has been found satisfactory for this purpose.

⁵ Reagent Chemicals, American Chemical Society Specifications, "Am. Chemical Soc., Washington, D.C. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by Joseph Rosin, D. Van Nostrand Co., Inc., New York, NY, and the "United States Pharmacopeia."