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Standard Test Method for Hydrogen Sulfide in Liquefied Petroleum (LP) Gases (Lead Acetate Method)[1]

This standard is issued under the fixed designation D2420; 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~~ Scope*

1.1 This test method[2] covers the detection of hydrogen sulfide in liquefied petroleum (LP) gases. The sensitivity of the test is about 4 mg/m^3 (0.15 to 0.2 grain of hydrogen sulfide per 100 ft^3) of gas.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D1193 Specification for Reagent Water

D1265 Practice for Sampling Liquefied Petroleum (LP) Gases, Manual Method

D1835 Specification for Liquefied Petroleum (LP) Gases

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

2.2 *GPA Standard:*[4]

GPA 2140 Liquefied Petroleum Gas Specifications and Test Methods

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

[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.H0 on Liquefied Petroleum Gas.

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[2] This test method is based on Edwards, J. D., and McBride, R. S., "Lead Acetate Test for Hydrogen Sulphide in Gas," *Technologic Papers T41*, National Institute for Standards and Technology, Aug. 9, 1914.

[3] 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.

[4] Available from Gas Processors Association (GPA), 66 American Plaza, Suite 700, Tulsa, OK 74135, http://www.gpaglobal.org.

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

3.1.2 *liquefied petroleum gas (LP gas, LPG), n*—a narrow boiling range mixture of hydrocarbons consisting of propane, propylene, butanes and butylenes, individually or in specified combinations, with limited amounts of other hydrocarbons (such as ethane) and may contain naturally occurring, petroleum-derived, non-hydrocarbons.

4. Summary of Test Method

4.1 Vaporized LP gas is passed over moist lead acetate paper under controlled conditions. Hydrogen sulfide reacts with lead acetate to form lead sulfide which produces a coloration on the paper varying from yellow to black, depending upon the amount of hydrogen sulfide present.

5. Significance and Use

5.1 Liquefied petroleum gases and their products of combustion must not be unduly corrosive to the materials with which they come in contact. The potential personnel exposure hazards of H_2S also make the detection and measurement of hydrogen sulfide important, even in low concentrations. In addition, in some cases the odor of the gases shall not be objectionable. (See Specification D1835 and GPA 2140.)

6. Interferences

6.1 Methyl mercaptan, if present, produces a transitory yellow stain on the lead acetate paper that will fade completely in less than 5 min.

6.2 Other sulfur compounds present in liquefied petroleum gas do not interfere with the test.

7. Apparatus and Materials

7.1 *Apparatus for Detecting Hydrogen Sulfide in Liquefied Petroleum Gas,* as shown in Fig. 1 or commercially available apparatus.

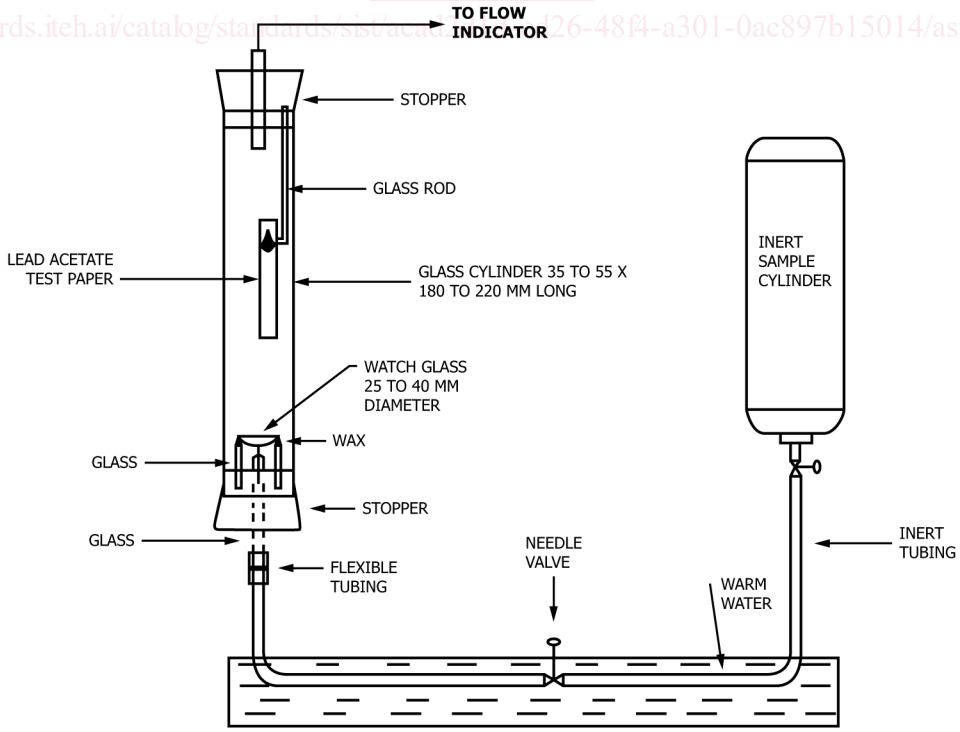

FIG. 1 Typical Apparatus for Detecting Hydrogen Sulfide in Liquefied Petroleum Gas

7.2 *Lead Acetate Test Paper*—Commercially available test paper is satisfactory. Alternatively, the test paper may be prepared by dipping strips of *smooth* filter paper in 5 % aqueous lead acetate solution and removing the excess solution with a clean blotter. The strips of paper shall be approximately 50 mm long and 10 mm wide and contain a 3 mm hole near one end so they will hang freely vertical in the test apparatus.

7.3 *Gas Flow Indicator*—Capable of measuring flow rates in the range of 2 L to 3 L of gas per minute. A wet test meter rotameter and mass flow controller have been found to be suitable.

7.4 *Water*—Unless otherwise indicated, reference to water shall be understood to mean reagent water that meets the requirements of Type II or III of Specification D1193, or distilled water.

7.5 *Tubing*—High-pressure connecting tubing to connect the test apparatus to the sample collection point. Internally clean, non-reactive and non-absorptive stainless steel material is recommended, but other materials that safely contain the pressure, resist being cut or torn, and have been tested to be inert relative to the stream being tested may be utilized.

7.5.1 Internal surfaces of sample containers, lines and fittings may be surface coated with an inert material to reduce bare metal surfaces which could react with, or absorb, trace hydrogen sulfide.[5]

7.6 *High–Pressure Sample Container, optional*—Designed for containing liquefied petroleum gas. An inert surface coating on the inner surface of the container may be used, and is recommended.

8. Sampling

8.1 Collect a representative sample by Practice D1265 using a clean, high–pressure sample container which is inert to hydrogen sulfide.

8.1.1 As an alternative sampling procedure, connect the test apparatus directly to the sample source and perform the test in the field. This method of direct field measurement eliminates any inaccuracy introduced by the sampling procedure or sample container.

8.2 (**Warning—**Experience has demonstrated that the chemical activity and physical absorptive properties of hydrogen sulfide can cause the concentration of H_2S in a liquefied petroleum gas sample to be depleted before analysis, even when the sample is contained in scrupulously clean, stainless steel sample cylinders. Conversely, an increase in sulfide concentration has been found to occur when samples of liquefied petroleum gas containing no hydrogen sulfide are transferred in sample cylinders that have not been properly cleaned and which have been in use with samples containing hydrogen sulfide. This demonstrates that data obtained on samples tested for hydrogen sulfide in the laboratory might not reliably represent the hydrogen sulfide concentration at the sample source.)

9. Procedure

9.1 Connect the test apparatus to the sample source by use of a minimum length of high-pressure tubing (see ~~6.5~~7.5).

9.2 Flush the line and apparatus for about 1 min.

9.3 Fill the water bath with warm water (50 °C to 70 °C). Tap water is satisfactory.

9.4 By use of the needle valve, adjust the rate of gas flow to 2.3 L⁄min ± 0.2 L⁄min.

9.5 Immediately, place a single strip of water-moistened lead acetate paper on the hook in the test cylinder so that the paper is held midway between the watchglass and the bottom of the upper stopper.

[5] Internal surface coatings and coated cylinders are available commercially.