



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*

1.1 This test method² covers the detection of hydrogen sulfide in liquefied petroleum (LP) gases. The sensitivity of the test is about 4 mg/m³ (0.15 to 0.2 grain of hydrogen sulfide per 100 ft³) of gas.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

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

2. Referenced Documents

2.1 *ASTM Standards:*³

D1835 Specification for Liquefied Petroleum (LP) Gases

2.2 *GPA Standard:*⁴

GPA 2140 Liquefied Petroleum Gas Specifications and Test Methods

3. Summary of Test Method

3.1 The 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.

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.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), 6526 E. 60th St., Tulsa, OK 74145.

4. Significance and Use

4.1 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 H₂S also make the detection and measurement of hydrogen sulfide important, even in low concentrations. In addition, in some cases the odor of the gases must not be objectionable. (See Specification **D1835** and **GPA 2140**.)

5. Interferences

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

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

6. Apparatus and Materials

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

6.2 *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.

6.3 *Flow Indicator*—A wet test meter or a rotameter, which measures flow rates in the range of 2 to 3 L of gas/min.

6.4 *Water*—Distilled.

6.5 *Tubing*—High pressure connecting tubing to connect the test apparatus to the sample collection point. Internally clean 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. Sampling

7.1 (**Warning**—Because of the chemical activity and physical adsorptive properties of hydrogen sulfide, it is highly desirable to connect the test apparatus directly to the sample

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

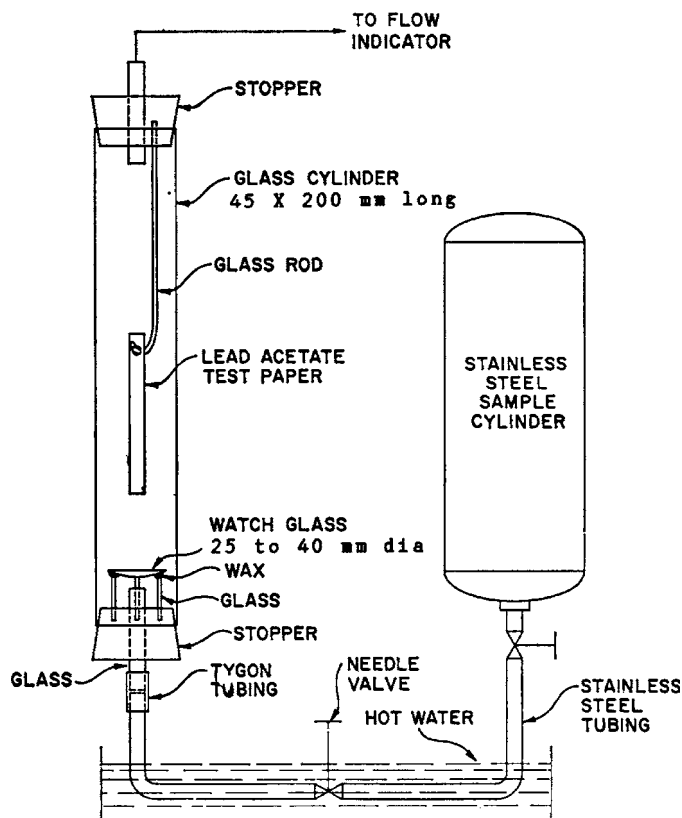


FIG. 1 Apparatus for Detecting Hydrogen Sulfide in Liquefied Petroleum Gas

source and perform the test in the field, rather than transferring sample into a sample cylinder for testing in the laboratory. Experience has demonstrated that the hydrogen sulfide concentration in liquefied petroleum gas is frequently depleted before analysis, even when the sample is contained in scrupulously clean, stainless steel sample cylinders. The exact opposite condition, an increase in sulfide concentration, has been found to occur when samples of liquefied petroleum gas containing no hydrogen sulfide are transferred into 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 can be unreliable.)

8. Procedure

8.1 Connect the test apparatus to the sample source by use of a minimum length of clean stainless steel tubing or other material that safely contains the pressure, resists being cut or torn, and has been tested to be inert relative to the stream being tested.

8.2 Flush the line and apparatus for about 1 min.

8.3 Fill the water reservoir with warm water (50 to 70°C).

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

8.5 Immediately, place a single strip of distilled 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.

8.6 Expose the *moist* paper for *exactly* 2 min to the gas flow of 2.3 ± 0.2 L/min. Remove the test paper and proceed as described in Section 9.

9. Report

9.1 Compare the exposed test paper with a moist test paper that has not been exposed.

9.1.1 In the absence of distinct coloration, report hydrogen sulfide as “negative” (“pass”).

9.1.2 If there is a distinct coloration, wait 5 min before interpreting the test results. If, after 5 min, the paper has no distinct coloration, rate the sample as “negative” (“pass”). If the paper does have a distinct coloration after 5 min, rate the sample as “positive” (“fail”).

NOTE 1—The presence of methyl mercaptan in liquefied petroleum gas gives a distinct yellow stain to the test paper which, however, fades completely in less than 5 min.

NOTE 2—Concentrations of H_2S in LPG of 4 mg/m^3 and higher will give a positive result.

9.2 Report the result, with reference to this test method, as either “negative” (“pass”) or “positive” (“fail”).

10. Precision and Bias

10.1 In the case of pass-fail data or results from other qualitative tests no generally accepted method for determining precision or bias is currently available.

10.2 *Bias*—The procedure in Test Method D2420 for measuring hydrogen sulfide has no bias because the value of hydrogen sulfide is defined only in terms of this test method.

11. Keywords

11.1 hydrogen sulfide; liquefied petroleum (LP) gases

SUMMARY OF CHANGES

Subcommittee D02.H0 has identified the location of selected changes to this standard since the last issue (D2420–91(2001)) that may impact the use of this standard.

- (1) Revised **1.1, 3.1, 4.1, 6.4, 6.5, 7.1, 8.1.**
- (2) Added Section **5, Note 1, Note 2, and 9.2.**
- (3) Reorganized Sections **8 and 9.**

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