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An American National Standard

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Standard Test Method for Sulfur in Petroleum Products (Lamp Method)[1]

This standard is issued under the fixed designation D 1266; 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.
This test method has been adopted for use by government agencies to replace Method 5201 of Federal Test Method Standard No. 791b

1. Scope

1.1 This test method covers the determination of total sulfur in liquid petroleum products in concentrations from 0.01 to 0.4 mass % (Note 1). A special sulfate analysis procedure is described in Annex A1 that permits the determination of sulfur in concentrations as low as 5 mg/kg.

NOTE 1—The comparable lamp method for the determination of sulfur in liquefied petroleum gas is described in Test Method D 2784D 2784. For the determination of sulfur in heavier petroleum products that cannot be burned in a lamp, see the bomb method (Test Method D 129D 129) the quartz tube method (IP 63), or the high-temperature method (Test Method D 1552D 1552).

1.2 The direct burning procedure (Section 9) is applicable to the analysis of such materials as gasoline, kerosine, naphtha, and other liquids that can be burned completely in a wick lamp. The blending procedure (Section 10) is applicable to the analysis of gas oils and distillate fuel oils, naphthenic acids, alkyl phenols, high sulfur content petroleum products, and many other materials that cannot be burned satisfactorily by the direct burning procedure.

1.3 Phosphorus compounds normally present in commercial gasoline do not interfere. A correction is given for the small amount of acid resulting from the combustion of the lead anti-knock fluids in gasolines. Appreciable concentrations of acid-forming or base-forming elements from other sources interfere when the titration procedure is employed since no correction is provided in these cases.

1.4 The preferred units are acceptable metric units.

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.* For specific hazard statements, see Note 5.

2. Referenced Documents

2.1 *ASTM Standards:*

D 129 Test Method for Sulfur in Petroleum Products (General Bomb Method)[2]

D 1193 Specification for Reagent Water[3]

D 1229 Test Method for Rubber Property—Compression Set at Low Temperatures[4]

D 1552 Test Method for Sulfur in Petroleum Products (High Temperature Method)[2]

D 2784 Test Method for Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner or Lamp)[2]

E 11 Specification for Wire–Cloth Sieves for Testing Purposes[5]

2.2 *Institute of Petroleum Standard:*[6]

IP 63 Sulfur Content — The Quartz Tube Method

3. Summary of Test Method

3.1 The sample is burned in a closed system, using a suitable lamp (Fig. 1) and an artificial atmosphere composed of 70 % carbon dioxide and 30 % oxygen to prevent formation of nitrogen oxides. The oxides of sulfur are absorbed and oxidized to sulfuric acid by means of hydrogen peroxide solution which is then flushed with air to remove dissolved carbon dioxide. Sulfur as sulfate in the absorbent is determined acidimetrically by titration with standard sodium hydroxide solution, or gravimetrically by precipitation as barium sulfate (see Annex A2).

3.2 Alternatively, the sample may be burned in air, the sulfur as sulfate in the absorbent being determined by precipitation as barium sulfate for weighing (see Annex A2).

NOTE 2—In the absence of acid-forming or base-forming elements, other than sulfur, results by the volumetric and gravimetric finishes described are equivalent within the limits of precision of the method.

[1] This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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[2] *Annual Book of ASTM Standards,* Vol 05.01.

[3] *Annual Book of ASTM Standards,* Vol 11.01.

[4] *Annual Book of ASTM Standards,* Vol 09.01.

[5] *Annual Book of ASTM Standards,* Vol 14.02.

[6] Available from the Institute of Petroleum, 61 New Cavendish St., London, W.I., England.

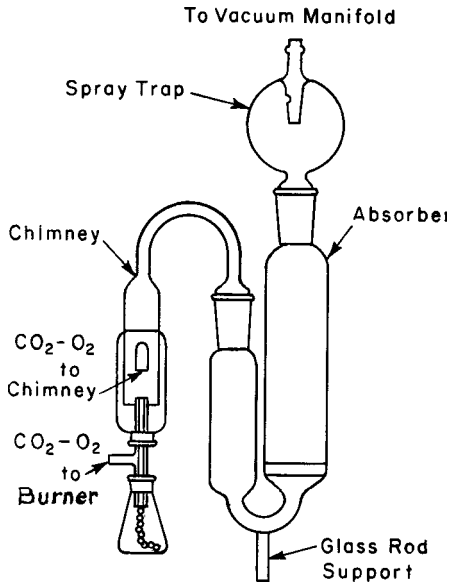

FIG. 1 Illustrative Sketch of the Assembled Lamp Unit

3.3 For sulfur contents below 0.01 mass % it is necessary to determine the sulfate content in the absorber solution turbidimetrically as barium sulfate (see Annex A1).

4. Significance and Use

4.1 This test method provides a means of monitoring the sulfur level of various petroleum products and additives. This knowledge can be used to predict performance, handling, or processing properties. In some cases the presence of sulfur components is beneficial to the product and monitoring the depletion of sulfur compounds provides useful information. In other cases the presence of sulfur compounds is detrimental to the processing or use of the product.

5. Apparatus

5.1 *Absorbers, Chimneys, Lamps, and Spray Traps* (Fig. 1), as required are described in detail in Annex A3. The standard flask and burner (Fig. A3.1) as shown is not suitable for burning highly aromatic mixtures without blending. The flask and burner for aromatic samples (Fig. A3.1) permits burning these samples directly without blending and may also be used to burn nonaromatic samples; with this lamp, a second port with control valve in the burner manifold is required.

5.2 *Cotton Wicking*[7]—Clean, unused, uniform, twisted white cotton yarn of good quality. For the burner to burn aromatic samples use long staple, fine-spun, commercial *fine* grade.[8]

5.3 *Manifold System*, consisting of a vacuum manifold with regulating device, valves, and so forth (Fig. 2)

[7] Yarn, white, 4–strand (2 to 3 mg/cm/strand), available from Koehler Instrument Co., 1595 Sycamore Ave., Bohemia, NY 11716, or the type marketed by various suppliers in the United Kingdom as 13s/14 ends, scoured, and bleached has been found suitable for this purpose.

[8] Available from Thomas Scientific, P.O. Box 99, Swedesboro, NJ 08085-0099.

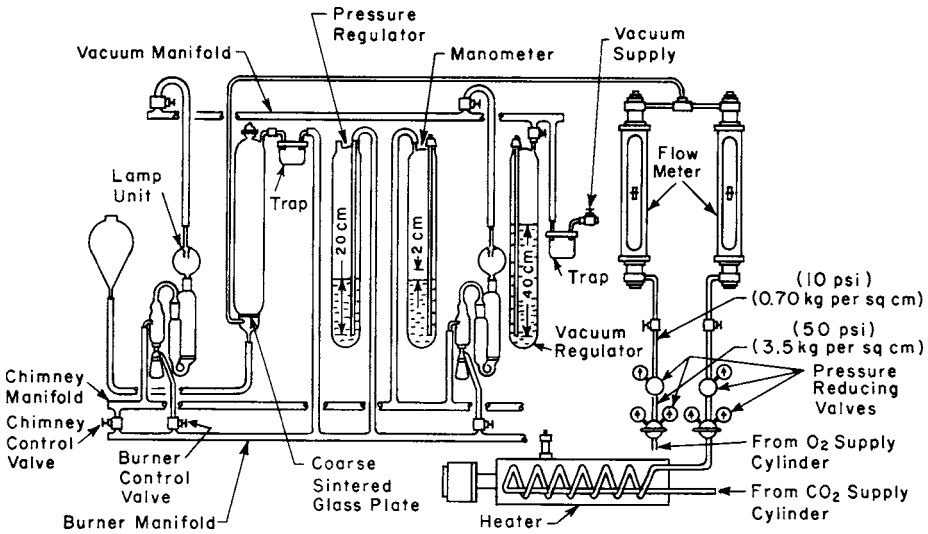

FIG. 2 Schematic Diagram of CO_2-O_2 Supply Manifold and Lamp System