Designation: D 1662 – 92 (Reapproved 1997)

An American National Standard

AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Active Sulfur in Cutting Oils[1]

This standard is issued under the fixed designation D 1662; 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 active sulfur in cutting oils. This test method applies to sulfur reactive with copper powder at a temperature of 150°C (300°F) in cutting fluids containing both natural and added sulfur.

NOTE 1—It has not been established by ASTM as to how the active sulfur content thus determined may relate to field performance of the cutting fluid.

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

1.3 *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 Documents

2.1 *ASTM Standards:*

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

D 130 Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test[2]

3. Terminology

3.1 *Definition of a Term Specific to This Standard:*

3.1.1 *active sulfur*—the sulfur in a cutting fluid that will react with metallic copper at a temperature of 149°C (300°F) under the prescribed conditions.

4. Summary of Test Method

4.1 A portion of the sample is treated with copper powder at 149°C (300°F). The copper powder is filtered from the mixture. Active sulfur is expressed as the difference between the sulfur contents of the sample, as determined by Test Method D 129 before and after treatment with copper.

5. Significance and Use

5.1 This test method measures the quantity of sulfur available to react with metallic surfaces to form solid lubricating aids at the temperature of the test. Rates of reaction are metal type, temperature, and time dependent.

6. Apparatus

6.1 The apparatus shall be the same as that described in Test Method D 129 in addition to the following:

6.2 *Stirrer*, constructed of glass in the form of an inverted T. A flat blade, approximate length 25 mm, height 6 mm, thickness 1 mm, shall be attached to a glass rod 6 mm in diameter, in such a way that the blade is symmetrical with the rod and has its flat surface in the vertical plane. Alternatively, a glass-coated magnetic stirring bar 9.5 by 34.9 mm ± 2 mm (⅜ by 1⅜ in.) can be used.

6.3 *Stirring Apparatus*—An electric motor capable of maintaining a speed of 500 ± 25 rpm. Alternatively, when using the glass-coated stirring bar, a combination magnetic stirrer-hot plate is required.

6.4 *Hot Plate*, electric, or other convenient heat source capable of maintaining the sample at a temperature of 150 ± 3°C (300 ± 5°F).

6.5 *Beaker*, 200-mL, tall-form of heat-resistant glass, with a pour-out spout.

7. Materials

7.1 The materials shall be the same as described in Test Method D 129 in addition to the following:

7.2 *Copper Powder*. [3]

8. Procedure

8.1 Determine the sulfur concentration of the sample to be tested in accordance with Test Method D 129.

8.2 Place 50 ± 2 g of sample in a 200-mL tall-form beaker, lower the stirrer to within 5 mm of the bottom of the beaker and add 5 ± 0.25 g of copper powder and heat to 150 ± 2°C (300 ± 5°F) while stirring at 500 ± 25 rpm. If a magnetic stirrer is used, rotate the stirring bar at 500 ± 25 rpm. When 150 ± 2°C (300 ± 5°F) is reached, add an additional 5 ± 0.25 g copper powder. Continue stirring at 150 ± 2°C (300 ± 5°F) for 30 ±

[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.L on Industrial Lubricants.

Current edition approved Sept. 15, 1992. Published November 1992. Originally published as D 1662 – 59. Last previous edition D 1662 – 86.

This test method was prepared under the joint sponsorship of the American Society of Lubrication Engineers. Accepted by ASLE January 1969.

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

[3] The following copper powders have been found satisfactory: Atlantic Flake Powder No. 5010, Fisher C-431, Copper Dust, and LaPine No. 72696 Copper Powder.