



## Standard Test Method for Active Sulfur in Cutting Oils<sup>1</sup>

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 approval. A superscript epsilon ( $\epsilon$ ) 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 (302°F) in cutting fluids containing both natural and added sulfur.

NOTE 1—It has not been established by ASTM Subcommittee D02.L0 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 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:*<sup>2</sup>

D 130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

### 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *active sulfur*—sulfur in a cutting fluid that will react with metallic copper at a temperature of 150°C (302°F) under the prescribed conditions.

### 4. Summary of Test Method

4.1 A portion of the sample is treated with copper powder at 150°C (302°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 before and after treatment with copper.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.L0.01 on Metal Removal Fluids and Lubricants.

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<sup>2</sup> 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.

### 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 *Filter Paper*, 2.5  $\mu\text{m}$  retention size.

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  $\pm$  2 mm ( $\frac{3}{8}$  by 1 $\frac{3}{8}$  in.) can be used.

6.3 *Stirring Apparatus*, electric motor capable of maintaining a speed of 500  $\pm$  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  $\pm$  2°C (302  $\pm$  5°F).

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

### 7. Materials

7.1 *Diluent*, sulfur-free white oil, methyl lardate or dialkylbenzene.

7.2 *Copper Powder*, >99 %, <75  $\mu\text{m}$  (200 mesh).

### 8. Procedure

8.1 Determine the sulfur concentration of the sample to be tested using any accepted method that has precision of  $\pm 0.15$  % for sulfur.

NOTE 2—For best results, dilute the sample with sulfur-free white oil, methyl lardate or dialkylbenzene to a sulfur content of 2 to 4 %.

8.2 Place 50  $\pm$  2 g of sample or sample dilution in a 200-mL tall-form beaker, lower the stirrer to within 5 mm of the bottom of the beaker and add 5  $\pm$  0.25 g of copper powder and heat to 150  $\pm$  2°C (302  $\pm$  5°F) while stirring at 500  $\pm$  25 rpm. If a magnetic stirrer is used, rotate the stirring bar at 500  $\pm$  25 rpm. When 150  $\pm$  2°C (302  $\pm$  5°F) is reached, add an additional 5  $\pm$  0.25 g copper powder. Continue stirring at 150  $\pm$  2°C (302  $\pm$  5°F) for 30  $\pm$  1 min. At the end of this period,

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