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Standard Test Method for VISCOSITY OF MATERIALS WITH A SLIDING PLATE MICROVISCOMETER¹

This Standard is issued under the fixed designation D 3570; 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 reappraisal.

1. Scope

1.1 This method covers the determination of the viscosity of asphalts, tars, pitches, and similar bituminous materials by means of a sliding-plate microviscometer. It is applicable to materials having viscosities in the range 10^4 to 10^9 Pa·s (10^5 to 10^{10} poise) and is therefore suitable for use at temperatures where viscosity is in the indicated range. The shear rate may vary between approximately 10^{-3} to 10^2 reciprocal seconds (s^{-1}), and the method is suitable for determinations on materials having either Newtonian or non-Newtonian flow properties.

1.2 Shear susceptibility may also be determined.

1.3 Method D 3205 may be considered as an equivalent test when the decreasing load sequence (alternative No. 2) is used.

2. Applicable Documents

2.1 ASTM Standards:

- D5 Test for Penetration of Bituminous Materials²
- D92 Test for Flash and Fire Points by Cleveland Open Cup³
- D93 Test for Flash Point by Pensky-Martens Closed Tester⁴
- D3205 Test for Viscosity of Asphalt with Cone and Plate Viscometer²
- E1 Specifications for ASTM Thermometers⁵
- E4 Verification of Testing Machines⁶

3. Summary of Method

3.1 Two procedures can be used to determine the viscosity with a sliding-plate viscometer. Procedure A makes use of an apparatus

that creates a controlled load. Procedure B utilizes an apparatus that creates a controlled rate of deformation. The procedures apply to two specific instruments; other sliding-plate rheometers that produce equivalent results may be used.

3.2 *Procedure A*—A film 50, 100, 300 or 500 μm thick (depending on the viscosity of the sample and the test temperature) is placed between two matched steel plates (Figs. 1 and 2). One of a pair of the steel plates is clamped to the viscometer frame and the other to a device for adding the load. Five different loadings are used and the displacement rate recorded for the movable plate. Data developed permit calculation of rate of shear, shear stress, viscosity, and shear susceptibility.

3.3 *Procedure B*—An asphalt film of determined thickness is formed between matched pairs of aluminum, steel, or glass plates. One plate is clamped in a fixed position, the other is displaced at constant, preselected velocities, and the shearing force is measured (Figs. 3 and 4). Rate of shear, shear stress, and viscosity are calculated from the dimensions of the specimen, displacement rate, and the shearing force developed in the test. When several displacement rates are

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² *Annual Book of ASTM Standards*, Part 15.

³ *Annual Book of ASTM Standards*, Parts 15, 23, and 40.

⁴ *Annual Book of ASTM Standards*, Parts 15, 22, 23, and 29.

⁵ *Annual Book of ASTM Standards*, Parts 25 and 44.

⁶ *Annual Book of ASTM Standards*, Parts 10, 14, 32, 35, and 41.