



Standard Test Method for Determining the Apparent Viscosity of Polyethylene Wax¹

This standard is issued under the fixed designation D 1986; 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 the viscosity in centipoise of polyethylene wax using the Brookfield LVT or LVF viscometer and thermosel system.

1.2 *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:*

E 1 Specification for ASTM Thermometers²

3. Terminology

3.1 *Definitions:*

3.1.1 *polyethylene wax*—polymerized ethylene with a molecular weight 2,000 to 10,000 and a density of 0.9 to 1.0 g/cm³. These polymers can be oxidized or copolymerized but should have a melt point lower than 140°C.

3.1.2 *viscosity*—the ratio of shear stress to shear rate. The viscosity of a liquid is a measure of the internal friction of the liquid in motion. The units of viscosity is the pascal second. For a Newtonian liquid, the viscosity is constant at all shear rates. For a non-Newtonian liquid, viscosity will vary depending on shear rate.

3.1.3 *apparent viscosity*—the viscosity determined by this test method and expressed in millipascal seconds. Its value may vary with the spindle and rotational speed selected because many waxes are non-Newtonian.

4. Significance and Use

4.1 This test method is used to determine a physical property of a wax and may determine the utility of the wax, as well as being a significant quality control test.

5. Apparatus

5.1 *Brookfield Thermosel System*, with LVT, LVF, or LVD

111 viscometer and SC 4-31 spindle.³

6. Calibration

6.1 The viscometer is precalibrated using Newtonian fluids provided by the manufacturer. No zero adjustment is provided since experience has shown that the zero point will not vary due to changes in the spring. The viscometer and spindles are precision equipment and should be kept from undue shock and mishandling. Physical damage to the instrument will often reveal itself as erratic or no oscillation of the pointer when the instrument, with or without the spindle in place, is operated in air. When operating normally, the pointer will be stable and have free oscillation about the zero point in air.

6.2 The instrument may be further calibrated using standard reference fluids. Suitable fluids are available in nominal viscosities up to 15 000 mPa·s at 149°C (300°F).³ The procedure for instrument calibration using standard reference fluids is not encompassed by this test method. Results obtained using standard reference fluids should not deviate from the nominal viscosity by more than 2 %.

6.3 The temperature controller of the type recommended for this procedure is factory calibrated and has control capability of ± 0.5 % of the control point ($\pm 1.0^\circ\text{C}$ at 175°C). To further check the controller and further establish controller settings, use the following procedure. Place a sufficient quantity of polyethylene wax in the sample container to permit immersion of the appropriate ASTM thermometer to the proper depth. Do not permit the thermometer bulb to rest on the bottom of the sample container. Suitable thermometers are shown in Specification E 1.

6.4 Insert the thermometer through the insulating cover of the sample container and hold it in place at the point required for proper immersion depth. Adjust the thermal controller to provide the desired test temperature. Rotate the thermometer during temperature reading to minimize the effect of thermal gradients in the sample. Continue temperature readings and controller adjustment until minimum deviation from test temperature is obtained. Minimum deviation may vary between laboratories, depending upon the controller, but should in no case exceed $\pm 0.5^\circ\text{C}$ (0.9°F). Repeat this procedure for any test

¹ This test method is under the jurisdiction of ASTM Committee D21 on Polishes and is the direct responsibility of Subcommittee D21.02 on Raw Materials.

Current edition approved Feb. 22, 1991. Published April 1991.

² *Annual Book of ASTM Standards*, Vol 14.03.

³ Available from Brookfield Engineering Lab Inc., 240 Cushing Street, Stoughton, MA 02072.