



Designation: D5018 – 23

Standard Test Method for Shear Viscosity of Coal-Tar and Petroleum Pitches¹

This standard is issued under the fixed designation D5018; 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 apparent shear viscosity of coal-tar and petroleum-based pitches having a Mettler softening point (SP) range of approximately 95 °C to 120 °C (see Test Method [D3104](#)).

1.2 This test method is applicable only for rotational viscometers.

1.3 Since this test method is based on theoretical grounds, strict adherence to details of the procedure is necessary to comply with the theoretical requirements.

1.4 The values stated in SI units are to be regarded as standard.

1.4.1 *Exception*—The values stated in conventional units (centipoise) are to be regarded as the standard for viscosity measurement only. The SI unit is the pascal second (Pa·s) and one millipascal second (mPa·s) = one centipoise (cP); centipoise is in cgs 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 8.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

¹ This test method is under the jurisdiction of ASTM Committee [D02](#) on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee [D02.05](#) on Properties of Fuels, Petroleum Coke and Carbon Material.

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² 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.

[D3104](#) Test Method for Softening Point of Pitches (Mettler Softening Point Method)

[D4175](#) Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

[D4296](#) Practice for Sampling Pitch

[E691](#) Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

[E1953](#) Practice for Description of Thermal Analysis and Rheology Apparatus

[E2975](#) Test Method for Calibration or Calibration Verification of Concentric Cylinder Rotational Viscometers

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminology [D4175](#).

4. Summary of Test Method

4.1 The viscosity of a pitch, over the temperature range of about 40 °C to 100 °C above the SP of the material, is determined using a rotational viscometer.

4.2 The recommended specifications herein are for measuring the apparent shear viscosity of binder pitches via a concentric cylinder viscometer. Apparent shear viscosity is the ratio of shear stress to shear rate in a unidirectional simple shear flow field at steady state conditions. A concentric cylinder viscometer is useful for measuring the apparent shear viscosity, provided the sample temperature is adequately controlled, the “end-effects” are negligible, and the gap between rotor/cup is small and remains constant during the test. The extrapolated value of apparent shear viscosity at “zero” shear rate is called shear viscosity.

5. Significance and Use

5.1 This test method is useful as one element in establishing the uniformity of shipments.

5.2 Viscosity is also valuable for rheological characterization of binder pitches. Binder pitch imparts consistency to carbonaceous mixes and affects their resistance to deformation. Binder pitch viscosity is important for assessing mix consistency and for evaluating the ease of mix extrusion or molding into artifacts.

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