



Standard Test Method for Determining Inherent Viscosity of Poly(Ethylene Terephthalate) (PET) by Glass Capillary Viscometer¹

This standard is issued under the fixed designation D 4603; 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 is for the determination of the inherent viscosity of poly(ethylene terephthalate) (PET) soluble at 0.50 % concentration in a 60/40 phenol/1,1,2,2-tetrachloroethane solution by means of a glass capillary viscometer. Highly crystalline forms of PET that are not soluble in this solvent mixture will require a different procedure.

1.2 The inherent viscosity values obtained by this test method are comparable with those obtained using differential viscometry described in Test Method D 5225.

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

1.4 *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. Specific hazards statements are given in Section 8.*

NOTE 1—This test method and ISO 1628-5 are similar but not technically equivalent. This ISO standard gives an option of solvents for PET. Solvent specified in this ASTM test method is one of the options in the ISO method. ISO also uses Type 1C Ubbelohde viscometer, rather than the 1B, and reports viscosity number, rather than inherent viscosity.

2. Referenced Documents

2.1 ASTM Standards:

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)²

D 446 Specification for Operating Instructions for Glass Capillary Kinematic Viscometers²

D 1972 Practice for Generic Marking of Plastic Products³

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.70 on Analytical Methods (D20.70.05).

Current edition approved March 10, 2003. Published April 2003. Originally approved in 1986. Last previous edition approved in 1996 as D 4603 – 96.

² Annual Book of ASTM Standards, Vol 05.01.

³ Annual Book of ASTM Standards, Vol 08.01.

D 5225 Test Method for Measuring Solution Viscosity of Polymers with a Differential Viscometer⁴

E 1 Specification for ASTM Thermometers⁵

E 380 Practice for Use of the International System of Units (SI)⁶

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁶

2.2 ISO Standard:

1628/5–1998 Determination of the Viscosity of Polymers in Dilute Solution Using Capillary Viscometers - Part 5: Thermoplastic Polyester (TP) homopolymers and Copolymers.⁷

2.3 NIST Standard:

C 602 Testing of Glass Volumetric Apparatus⁸

3. Terminology

3.1 Units, symbols, and abbreviations used in this test method are those recommended in Practice E 380.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *inherent viscosity* (also known as the logarithmic viscosity number)—defined by the equation given in 11.1.

3.2.2 *PET*—as outlined in Practice D 1972. The PET acronym may be used to avoid trademark infringement and to comply with various state or federal laws.

4. Summary of Test Method

4.1 The inherent viscosity is determined by measuring the flow time of a solution of known polymer concentration and the flow time of the pure solvent in a capillary viscometer at a fixed temperature. The inherent viscosity value is calculated from the flow time values.

⁴ Annual Book of ASTM Standards, Vol 08.03.

⁵ Annual Book of ASTM Standards, Vol 14.03.

⁶ Annual Book of ASTM Standards, Vol 14.02.

⁷ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁸ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 3460, Gaithersburg, MD 20899-3460.

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