



Designation: D 4603 – 96

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

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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. Some highly crystalline forms of PET may not be soluble in this solvent mixture and 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.

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

D 4019 Test Method for Moisture in Plastics by Coulometry⁴

D 5225 Test Method for Measuring Solution Viscosity of Polymers with a Differential Viscometer⁵

E 1 Specification for ASTM Thermometers⁶

E 380 Practice for Use of the International System of Units (SI)⁷

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁷

2.2 ISO Standard:

1628/5-1986 Determination of Viscosity Number and Limiting Number—Part 5⁸

2.3 NIST Standard:

C 602 Testing of Glass Volumetric Apparatus⁹

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.

5. Significance and Use

5.1 The inherent viscosity is relatable to the composition and molecular weight of a polyester resin. It must be controlled so that the processability and end properties of the resin remain in a desired range.

6. Apparatus

6.1 *Cannon Ubbelohde Type 1B Viscometer*, as described in Specifications and Operating Instructions D 446.

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This edition includes a title change and revised precision and bias statement.

² *Annual Book of ASTM Standards*, Vol 05.01.

³ *Annual Book of ASTM Standards*, Vol 08.01.

⁴ *Annual Book of ASTM Standards*, Vol 08.02.

⁵ *Annual Book of ASTM Standards*, Vol 08.03.

⁶ *Annual Book of ASTM Standards*, Vol 14.03.

⁷ *Annual Book of ASTM Standards*, Vol 14.02.

⁸ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁹ Available from the National Institute of Standards and Technology, U.S. Department of Commerce, Washington, DC 20234.