



Standard Practice for Dilute Solution Viscosity of Polymers¹

This standard is issued under the fixed designation D 2857; 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 practice covers the determination of the dilute solution viscosity of polymers. There are several ASTM standards (Test Methods D 789, D 1243, D 1601, and D 4603, and Practice D 3591) that describe dilute solution viscosity procedures for specific polymers, such as nylon, poly(vinyl chloride), polyethylene, and poly(ethylene terephthalate). This practice is written to augment these standards when problems arise with which the specific procedure is not concerned, or when no standard is available for the polymer under investigation.

1.2 This practice is applicable to all polymers that dissolve completely without chemical reaction or degradation to form solutions that are stable with time at a temperature between ambient and 150°C. Results are usually expressed as relative viscosity (viscosity ratio), inherent viscosity (logarithmic viscosity number), or intrinsic viscosity (limiting viscosity number) (see 3.1).

1.3 For polyamides, relative viscosity values by this procedure are not equivalent to those determined by Test Methods D 789.

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.*

NOTE 1—This standard and ISO 1628, “Plastics—Determination of Viscosity Number and Limiting Viscosity Number,” are technically equivalent.

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 Specifications and Operating Instructions for Glass Capillary Kinematic Viscometers²
- D 789 Test Methods for Determination of Relative Viscosity, Melting Point, and Moisture Content of Polyamide (PA)³

2.2 ISO Standard:

2.3 National Institute of Standards and Technology Document:

3. Terminology

3.1 *Definitions*—Terms and definitions in Terminology D 883 and abbreviations in Terminology D 1600 are applicable to this practice. The following definitions⁹ are applicable to this practice.

3.1.1 *inherent viscosity*, η_{inh} , n —the ratio of the natural logarithm of the relative viscosity to the mass concentration of the polymer, c : $\eta_{inh} = (\ln \eta_r)/c$.

3.1.1.1 *Discussion*—Also known as the logarithmic viscosity number, η_{ln} . See also 3.1.3.

3.1.2 *intrinsic viscosity*, $[\eta]$, n —the limiting value of the reduced viscosity or the inherent viscosity at infinite dilution

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

⁸ Available from National Institute of Standards and Technology, U.S. Department of Commerce, Washington, DC 20234.

⁹ International Union of Pure and Applied Chemistry, *Compendium of Macromolecular Nomenclature*, Blackwell Scientific Publications, Oxford, England, 1991.

¹ This practice is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.70 on Analytical Methods.

Current edition approved Feb. 15, 1995. Published April 1995. Originally published as D 2857 – 70. Last previous edition D 2857 – 93.

² Annual Book of ASTM Standards, Vol 05.01.