



Designation: D6474 – 20

Standard Test Method for Determining Molecular Weight Distribution and Molecular Weight Averages of Polyolefins by High Temperature Gel Permeation Chromatography¹

This standard is issued under the fixed designation D6474; 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 molecular weight distributions and molecular weight averages of polyolefins by high temperature gel permeation chromatography (GPC). This test method uses commercially available polystyrene standards and equipment and is applicable to polyethylenes (excluding high pressure low density polyethylene (LDPE) and ultra-high molecular weight polyethylene (UHMWPE)) and polypropylenes soluble in 1,2,4-trichlorobenzene (TCB) at 140°C. This test method is not absolute and requires calibration.

NOTE 1—Size exclusion chromatography (SEC) often is used as an alternative name for gel permeation chromatography (GPC).

NOTE 2—Specific methods and capabilities of users may vary with differences in columns, instrumentation, applications software, and practices between laboratories.

NOTE 3—One general method is outlined herein; alternative analytical practices can be followed and are attached in notes where appropriate.

NOTE 4—There is no known ISO equivalent to this standard.

1.2 The values stated in SI units, based on **IEEE/ASTM S1-10**, are to be regarded as the standard.

1.3 *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.*

1.4 *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

D883 Terminology Relating to Plastics

D3016 Practice for Use of Liquid Exclusion Chromatography Terms and Relationships

D5296 Test Method for Molecular Weight Averages and Molecular Weight Distribution of Polystyrene by High Performance Size-Exclusion Chromatography

E685 Practice for Testing Fixed-Wavelength Photometric Detectors Used in Liquid Chromatography

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

IEEE/ASTM S1-10 Standard for Use of the International System of Units (SI): The Modern System (replaces ASTM E 380 and ANSI/IEEE Standard 268-1992)

3. Terminology

3.1 *Definitions*—Definitions of terms applying to plastics appear in Terminology **D883**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *polyolefin, n*—used in this context, refers to PE (except LDPE) and PP thermoplastics.

4. Summary of Test Method

4.1 In this test method, a polyolefin sample is dissolved in a solvent and injected onto a chromatographic column(s) packed with a substrate, which separates the molecules according to their size in solution. The separated molecules are detected and recorded as they elute from the column according to size by a concentration sensitive detector. Through calibration, retention times are converted to molecular weights. Molecular weight averages and molecular weight distributions are determined from the calibration curve and detector response.

5. Significance and Use

5.1 This test method measures the molecular weight distribution and molecular weight averages of polyethylene (except

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.

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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.

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