



Designation: D2238 – 22

Standard Test Methods for Absorbance of Polyethylene Due to Methyl Groups¹ at 1378 cm⁻¹

This standard is issued under the fixed designation D2238; 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 These test methods cover measurement by infrared absorption spectrophotometry of the 1378 cm⁻¹ (7.25 μm) band in polyethylene due to methyl groups. (1, 2, 3-6)² Two test methods are covered:

1.1.1 *Test Method A* uses compensation with a standard sample film of known methyl content.

1.1.2 *Test Method B* uses compensation with a wedge of polymethylene or a polyethylene of known low methyl content.

1.2 These test methods are applicable to polyethylenes of Types I (density 0.910 to 0.925 g/cm³), II (density 0.926 to 0.940 g/cm³), and III (density 0.941 to 0.965 g/cm³).

NOTE 1—For determination of density, see Specifications D1505.

NOTE 2—In cases of Type III polyethylene with densities greater than 0.950 g/cm³, different results are obtained with the two test methods.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific hazards statements are given in Section 7.

NOTE 3—There is no known ISO equivalent to this standard.

1.5 *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.*

¹ These test methods are under the jurisdiction of ASTM Committee D20 on Plastics and are the direct responsibility of Subcommittee D20.70 on Analytical Methods (Section D20.70.08).

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² The boldface numbers in parentheses refer to the list of references at the end of these test methods.

2. Referenced Documents

2.1 *ASTM Standards*:³

D618 Practice for Conditioning Plastics for Testing

D883 Terminology Relating to Plastics

D1505 Test Method for Density of Plastics by the Density-Gradient Technique

E131 Terminology Relating to Molecular Spectroscopy

E168 Practices for General Techniques of Infrared Quantitative Analysis

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

IEEE/ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System

3. Terminology

3.1 For definitions of terms used in these test methods and associated with plastics issues refer to the terminology contained in Terminology D883.

3.2 Units, symbols, and abbreviations used in this test method appear in Terminology E131 or Practice IEEE/ASTM SI-10.

4. Significance and Use

4.1 When interpreted with the aid of appropriate calibration data, either test method is acceptable for use to compare the total methyl contents of polyethylenes made by similar processes. Data on infrared absorption at certain other wavelengths is potentially useful for information on certain other wavelengths (7).

NOTE 4—The bias of determination of the concentration of total alkyl groups depends on knowing the concentrations of methyl and ethyl branches present, since these branches have anomalously high absorptivities per group at 1378 cm⁻¹ (7.25 μm).

4.2 Knowledge of total methyl groups in polyethylene, when combined with data on molecular weight and on reactive end groups such as vinyl, is potentially useful so as to lead to

³ 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.