



Standard Practice for Determining Degradation End Point in Degradable Polyethylene and Polypropylene Using a Tensile Test¹

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1. Scope

1.1 This practice covers the determination of a degradation-end point (*a brittle point*) for degradable polyethylene/polypropylene films and sheeting less than 1.0 mm (0.04 in.) thick. This practice is not intended for determination of the rate of degree of degradation of a polyethylene/polypropylene film or sheet, but rather, to assess when in the course of its degradation under some condition, a brittle point is reached. If one wishes to monitor tensile elongation during the degradation process (such as when the tensile elongation is significantly greater than 5 %), Test Method D 882 is recommended. This practice should not be considered the only way of determining a degradation-end point.

1.2 Tensile properties of plastics 1.0 mm (0.04 in.) or greater in thickness shall be determined in accordance with Test Method D 638.

1.3 Use a static weighing-constant rate of grip separation test. This procedure employs a constant rate of separation of the grips holding the sample and a static load cell.

NOTE 1—This procedure is based on the use of grip separation as a measure of extension; however, the desirability of using extension indicators accurate to ± 1.0 % or better as specified in Test Method D 638 is recognized, and a provision for the use of such instrumentation is incorporated in the procedure.

1.4 This procedure has been successful for determining the degradation end point of ethylene-carbon-monoxide copolymers and has screened successfully two other additive-type polyethylenes in a round robin test.

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

1.6 *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.*

1.7 There is no equivalent ISO standard.

2. Referenced Documents

2.1 ASTM Standards:

- D 374 Test Methods for Thickness of Solid Electrical Insulation²
- D 618 Practice for Conditioning Plastics and Electric Insulating Materials for Testing³
- D 638M Test Method for Tensile Properties of Plastics [Metric]³
- D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting³
- D 5208 Practice for Operating Fluorescent UV and Condensation Apparatus for Exposure of Photodegradable Plastics⁴
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁵

3. Terminology

3.1 Definitions:

3.1.1 Definitions of terms and symbols relating to tension testing of plastics appear in the Annex to Test Method D 638.

3.1.2 line grips, *n*—in tensile testing machines, grips having faces designed to concentrate the entire gripping force along a single line perpendicular to the direction of testing stress.

3.1.3 tear failure, *n*—in tensile testing of films, a failure characterized by fracture initiating at one edge of the specimen and progressing across the specimen at a rate slow enough to produce an anomalous load-deformation curve.

3.2 Description of Terms Specific to This Standard:

3.2.1 *film, n*—for the purpose of this practice, a piece of material not exceeding 0.250 mm (0.01 in.) in thickness.

3.2.2 *brittle point, n*—in degradable polyethylene/polypropylene film, that point in the history of a material when 75 % of the specimens tested have a tensile elongation at break of 5 % or less.

¹ This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.96 on Environmentally Degradable Plastics.

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² *Annual Book of ASTM Standards*, Vol 10.01.

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

⁴ *Annual Book of ASTM Standards*, Vol 08.03.

⁵ *Annual Book of ASTM Standards*, Vol 14.02.