



Standard Test Method for Determining Anaerobic Biodegradation of Plastic Materials Under High-Solids Anaerobic-Digestion Conditions¹

This standard is issued under the fixed designation D5511; 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 the degree and rate of anaerobic biodegradation of plastic materials in high-solids anaerobic conditions. The test materials are exposed to a methanogenic inoculum derived from anaerobic digesters operating only on pretreated household waste. The anaerobic decomposition takes place under high-solids (more than 30 % total solids) and static non-mixed conditions.

1.2 This test method is designed to yield a percentage of conversion of carbon in the sample to carbon in the gaseous form under conditions found in high-solids anaerobic digesters, treating municipal solid waste (**1, 2, 3, 4**).² This test method may also resemble some conditions in biologically active landfills where the gas generated is recovered and biogas production is actively promoted by inoculation (for example, codeposition of anaerobic sewage sludge, anaerobic leachate recirculation), moisture control (for example, leachate recirculation), and temperature control (for example, short-term injection of oxygen, heating of recirculated leachate) (**5, 6, 7**).

1.3 This test method is designed to be applicable to all plastic materials that are not inhibitory to the microorganisms present in anaerobic digesters operating on household waste.

1.4 Claims of performance shall be limited to the numerical result obtained in the test and not be used for unqualified “biodegradable” claims. Reports shall clearly state the percentage of net gaseous carbon generation for both the test and reference samples at the completion of the test. Furthermore, results shall not be extrapolated past the actual duration of the test.

1.5 The values given in SI units are to be regarded as the standard.

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. Specific hazards are given in Section 8.*

NOTE 1—This test method is equivalent to ISO 15985.

2. Referenced Documents

2.1 ASTM Standards:³

D618 Practice for Conditioning Plastics for Testing

D883 Terminology Relating to Plastics

D1293 Test Methods for pH of Water

D1888 Methods Of Test for Particulate and Dissolved Matter in Water (Withdrawn 1989)⁴

D2908 Practice for Measuring Volatile Organic Matter in Water by Aqueous-Injection Gas Chromatography

D3590 Test Methods for Total Kjeldahl Nitrogen in Water

D4129 Test Method for Total and Organic Carbon in Water by High Temperature Oxidation and by Coulometric Detection

E260 Practice for Packed Column Gas Chromatography

E355 Practice for Gas Chromatography Terms and Relationships

2.2 APHA-AWWA-WPCF Standards:

2540 D Total Suspended Solids Dried at 103°–105°C⁵

2540 E Fixed and Volatile Solids Ignited at 550°C⁵

212 Nitrogen Ammonia⁵

2.3 ISO Standard:⁶

ISO 13641-1 Water quality—Determination of inhibition of gas production of anaerobic bacteria—Part 1: General test

ISO 15985 Plastics—Determination of the ultimate anaerobic biodegradability and disintegration under high-solids

¹ This test method is under the jurisdiction of ASTM Committee of **D20** on Plastics and is the direct responsibility of Subcommittee **D20.96** on Environmentally Degradable Plastics and Biobased Products.

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² The boldface numbers in parentheses refer to a list of references at the end of the text.

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.

⁴ The last approved version of this historical standard is referenced on www.astm.org.

⁵ *Standard Methods for the Examination of Water and Wastewater*, 17th Edition, 1989, American Public Health Association, 1740 Broadway, New York, NY 10018.

⁶ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.