

D5511-02 Standard Test Method for Determining Anaerobic Biodegradation of Plastic Materials Under High-Solids Anaerobic-Digestion Conditions.

Significance and Use

Biodegradation of a plastic within a high-solids anaerobic digestion unit is an important phenomenon because it will affect the decomposition of other waste materials enclosed by the plastic and the resulting quality and appearance of the compost after an anaerobic digestion process. Biodegradation of plastics could allow for the safe disposal of these plastics through aerobic and anaerobic solid-waste-treatment plants. This procedure has been developed to permit the determination of the rate and degree of anaerobic biodegradability of plastic products when placed in a high-solids anaerobic digester for the production of compost from municipal solid waste.

Limitations—Because there is a wide variation in the construction and operation of anaerobic-digestion systems and because regulatory requirements for composting systems vary, this procedure is not intended to simulate the environment of any particular high-solids anaerobic-digestion system. However, it is expected to resemble the environment of a high-solids anaerobic-digestion process operated under optimum conditions. More specifically, the procedure is intended to create a standard laboratory environment that will permit a rapid and reproducible determination of the anaerobic biodegradability under high-solids digestion conditions.

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)**. This test method may also resemble some conditions in biologically active landfills where the gas generated is recovered and biogas production is even actively promoted, for example, by inoculation (codeposition of anaerobic sewage sludge, anaerobic leachate recirculation), moisture control in the landfill (leachate recirculation), and temperature control (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 The values given in SI units are to be regarded as the standard.

1.5 This test method is equivalent to ISO DIS15985.

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.

2. Referenced Documents

ASTM Standards

[D1293](#) Test Methods for pH of Water

[D2908](#) Practice for Measuring Volatile Organic Matter in Water by Aqueous-Injection 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

[D618](#) Practice for Conditioning Plastics for Testing

[D883](#) Terminology Relating to Plastics

[E260](#) Practice for Packed Column Gas Chromatography

[E355](#) Practice for Gas Chromatography Terms and Relationships

APHA-AWWA-WPCF Standards 212 Nitrogen Ammonia

ISO Standard ISODIS15985 Plastics-- Determination of the Ultimate Anaerobic Biodegradability and Disintegration Under High-Solids Anaerobic-Digestion Conditions-- Method by Analysis of Released Biogas