Designation: D 6340 – 98

Standard Test Methods for Determining Aerobic Biodegradation of Radiolabeled Plastic Materials in an Aqueous or Compost Environment[1]

This standard is issued under the fixed designation D 6340; 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 directly determine the rate and degree of biological oxidation of carbon in plastic materials when placed in a composting environment containing simulated municipal solid waste or an aqueous environment under laboratory conditions.

1.2 Test Method A utilizes a mixed culture derived from the target environment (waste water, sewage sludge, compost eluant, and other environmental sources). Temperature, mixing, and aeration are monitored and controlled.

1.2.1 This method has the sensitivity to determine biodegradation at concentrations commonly found in these environments.

1.3 Test Method B starts with fresh compost and proceeds through the normal composting process to an early mature stage. Temperature, aeration; and moisture are monitored and controlled.

1.3.1 This method can determine biodegradation at levels of the plastic commonly expected in municipal solid waste.

1.4 These test methods require that the target component of the plastic material be synthesized using the radioactive isotope carbon-14. Depending upon the objective, either a portion of the components of the plastic or all of the carbon can be uniformly labeled with carbon-14. The test method will determine how that labeled portion will be metabolized and biologically oxidized by the microorganisms in the system tested.

1.5 These test methods can be applied to any carbon-14 labeled compound as well as for plastic materials that have been formulated to biodegrade in a natural aerobic environment.

1.6 The synthesis and preparation of the radiolabled plastic is beyond the scope of these methods. Carbon-14 labeled polymers may be purchased from a number of commercial labs.

1.7 There are no ISO test methods that are equivalent to the test methods in this standard.

1.8 The safety problems associated with compost and radioactivity are not addressed in this standard. It is the responsibility of the user of this standard to establish appropriate safety and health practices. It is also incumbent on the user to conform to all the regulatory requirements, specifically those that relate to the use of open radioactive sources.

1.9 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 883 Terminology Relating to Plastics[2]

D 5209 Test Method for Determining the Aerobic Biodegradation of Plastic Materials in the Presence of Municipal Sewage Sludge[3]

D 5296 Test Method for Molecular Weight Averages and Molecular Weight Distribution of Polystyrene by High Performance Size Exclusion Chromatography[3]

D 5338 Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions[3]

D 5512 Practice for Exposing Plastics to Simulated Compost Environment Using an Externally Heated Reactor[3]

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods as they relate to composting, see Terminology D 883.

3.1.1 *specific activity, SA, n*—refers to the quantity of radioactivity per mass unit of compound (polymer, etc.), that is *dpmh*%.

3.2 Acronyms:

3.2.1 *Bq, n*—becquerel; SI unit where 1 curie (Ci) = $3.7 \cdot 10^{10}$ Bq.

3.2.2 *dpm, n*—disintegrations per minute, used to measure the quantity of radioactivity.

3.2.2.1 *Discussion*—The measure dpm is derived from counts per minute (cpm) where dpm = cmp-bkgd/counting efficiency. There are $2.2 \cdot 10^6$ dpm/µCi.

3.2.3 *mCi, n*—millicurie; 1/1000th of a curie (standard unit).

[1] These test methods are under the jurisdiction of Committee D20 on Plastics and are the direct responsibility of Subcommittee D20.96 on Degradable Plastics.

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[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 08.03.

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