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# Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics<sup>1</sup>

This standard is issued under the fixed designation D5596; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method covers equipment, specimen preparation techniques, and procedures for evaluating the dispersion of carbon black in polyolefin geosynthetics containing less than 5 % carbon black by weight.

1.2 This test method allows for a qualitative evaluation of carbon black agglomerates and other inclusions in polyolefin geosynthetics. This evaluation is based on carbon black dispersion size calculated area within microscopic fields of view.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—This test method is for the evaluation of carbon black dispersion. This test method does not support or evaluate the distribution of carbon black.

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D883 Terminology Relating to Plastics

D3053 Terminology Relating to Carbon Black

D4439 Terminology for Geosynthetics

E7 Terminology Relating to Metallography

## 3. Terminology

3.1 *Definitions:*

3.1.1 *carbon black, n*—a material consisting essentially of elemental carbon black in the form of near spherical colloidal

particles and coalesced particle aggregates of colloidal size, obtained by partial combustion or thermal decomposition of hydrocarbons. (D3053)

3.1.2 *carbon black agglomerate, n*—a cluster of physically bound and entangled aggregates. (D3053)

3.1.3 *geosynthetic, n*—a planar product manufactured from polymeric material used with soil, rock, earth, or other geotechnical engineering-related material as an integral part of a man-made project, structure, or system. (D4439)

3.1.4 *micrograph, n*—a graphic reproduction of an object as seen through the microscope or equivalent optical instrument, at magnifications greater than ten diameters (micrograph). (E7)

3.1.5 *microtome, n (that is, sliding microtome)*—an apparatus capable of cutting thin slices (less than 20  $\mu\text{m}$  in thickness) of various geosynthetic samples.

3.1.6 *polyolefin, n*—a polymer prepared by the polymerization of an olefin(s) as the sole monomer(s). (D883)

3.1.7 *dispersion, n*—a polyolefin product formulated with carbon black.

3.1.8 *distribution, n*—a property of a carbon black formulated polyolefin product that refers to the existence of streaks, light or dark, within a microsectioned sample.

## 4. Summary of Test Method

4.1 This test method consists of two parts: (1) microtome specimen preparation and (2) microscopic evaluation.

4.1.1 *Microtome Specimen Preparation*—A sample is clamped in the sample holder, which can be raised or lowered precisely in increments of approximately 1  $\mu\text{m}$ . A rigid knife is slid manually across the sample so that the specimens range in thickness from 8 to 20  $\mu\text{m}$ .

4.1.2 *Microtome specimen examination:* These thin sections are evaluated microscopically calculating the largest agglomerate or inclusion in each random field of view (Rf). The associated carbon dispersion chart can be used to assist to determining shape and area

## 5. Significance and Use

5.1 Carbon black is added to many polymers to provide long-term resistance to ultraviolet-induced degradation. To achieve this, carbon black should be dispersed uniformly

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.02 on Endurance Properties.

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<sup>2</sup> 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.