



Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique¹

This standard is issued under the fixed designation D 4218; 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 black polyethylene compounds containing channel or furnace black. It is not applicable to thermal black.

1.2 This test method is not suitable for plastics that char on pyrolysis and should not be attempted for plastics that generate corrosive fumes on pyrolysis.

1.3 The values stated in SI units are to be regarded as the standard.

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.* Specific hazard statements are given in Section 7.

NOTE 1—There is no similar or equivalent ISO standard.

2. Referenced Documents

2.1 ASTM Standards:

D 883 Terminology Relating to Plastics²

D 1603 Test Method for Carbon Black in Olefin Plastics²

D 2741 Test Method for Susceptibility of Polyethylene Bottles to Soot Accumulation³

E 380 Practice for Use of the International System of Units (SI) (The Modernized Metric System)⁴

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁴

3. Terminology

3.1 *Definitions:* For definitions of plastics terms used in this test method, see Terminology D 883.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *channel black*—those carbon blacks produced by a process that operates in an open system in which a multitude of

small diffusion flames burn in air and carbon is deposited on cooled surfaces.

3.2.2 *furnace black*—those carbon blacks produced using the principle of continuous oxidative combustion in closed systems.

3.2.3 *thermal black*—those carbon blacks based on a process that uses thermal decomposition in the absence of oxygen and operates in a closed system. Particles grow very slowly and can become very large and filamentous structures.

3.3 *Symbols: Symbols*—Units and symbols used in this test method are those recommended in Practice E 380.

4. Summary of Test Method

4.1 Black polyethylene compound contained in a disposable aluminum weighing dish is pyrolyzed in a muffle furnace for a short period. During the pyrolysis of the polymer, the air in the muffle furnace becomes oxygen-deficient to prevent the combustion of the residual carbon black. Any soot, as defined in Test Method D 2741, produced by the initial combustion of the gases is consumed before the carbon black itself.

4.2 After cooling and weighing for residual carbon black, the dish and contents may be reinserted into the muffle furnace to determine ash content and the results used to determine true carbon black content. This should be done only if the compound is suspected of containing mineral fillers as well as carbon black.

5. Significance and Use

5.1 This test method is capable of yielding duplicate test data, in 20 min or less, for a simple carbon black content determination.

5.2 This test method is suitable for manufacturing quality control, technical service, and research work.

5.3 For referee requirements, the number of replicate measurements is increased. Alternatively, a control sample of known carbon black content is tested with the unknown sample.

5.4 Test Method D 1603 is available for referee testing should the involved parties so desire.

6. Apparatus

6.1 *Fume Hood or Vent Hood.*

6.2 *Muffle Furnace,* approximately 100 mm in the three internal dimensions. Furnaces with larger internal dimensions

¹ This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.70 on Analytical Methods (Section D20.70.01).

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This revision includes the addition of an ISO equivalence statement and an expanded terminology section.

² *Annual Book of ASTM Standards*, Vol 08.01

³ *Annual Book of ASTM Standards*, Vol 08.02.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.