Designation: ~~D1508 – 12 (Reapproved 2017)~~ D1508 – 23

Standard Test Method for Carbon Black, Pelleted Fines and Attrition[1]

This standard is issued under the fixed designation D1508; 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 fines and attrition of pelleted carbon black.

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

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1511 Test Method for Carbon Black—Pellet Size Distribution
D1799 Practice for Carbon Black—Sampling Packaged Shipments
D1900 Practice for Carbon Black—Sampling Bulk Shipments
D4483 Practice for Evaluating Precision for Test Method Standards in the Rubber and Carbon Black Manufacturing Industries
D5817 Practice for Carbon Black, Pelleted—Reduction, Blending, and Drying of Gross Samples for Testing
E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Summary of Test Method

3.1 *Method A, Fines*—A sample of carbon black is placed on a 125-µm sieve and shaken in a mechanical or vibratory sieve shaker for 5 min. The pellets, pellet fragments, dust, and unpelletized black that pass through the sieve are defined as carbon black fines. The fines are expressed in percent.

3.2 *Method B, Attrition*—The same test sample is shaken for an additional 15 min to determine the amount of pellet degradation or attrition created during this additional shake interval. The attrition is expressed in percent.

4. Significance and Use

4.1 *Method A, Fines*—The fines content of carbon black is related to the bulk flowability, dustiness, and, in some instances, the level of dispersion. Due to the many other variables that influence dispersion and handling, the significance of fines content must be determined by the user.

---

[1] This test method is under the jurisdiction of ASTM Committee D24 on Carbon Black and is the direct responsibility of Subcommittee D24.51 on Carbon Black Pellet Properties.

Current edition approved ~~Dec. 1, 2017~~May 1, 2023. Published ~~December 2017~~May 2023. Originally approved in 1957. Last previous edition approved in ~~2012~~2017 as D1508 – ~~12. DOI: 10.1520/D1508-12R17.~~12 (2017). DOI: 10.1520/D1508-23.

[2] 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.

4.2 *Method B, Attrition*—By comparing the percent fines and attrition, an indication can be obtained of pellet stability and the amount of fines that may be created by pellet degradation in conveying, handling or transit.

5. Apparatus

5.1 *Mechanical or Vibratory Sieve Shaker.*[3]

5.2 *Sieves,* six 125-µm (U.S. Standard No. 120) having a 200-mm (8-in.) diameter and 25-mm (1-in.) height, or equivalent, conforming to Specification E11.

5.3 *Sieve Separator Receivers,* five required.

5.4 *Sieve Cover.*

5.5 *Bottom Receiver Pan.*

5.6 *Riffle Sample Splitter.*

5.7 *Small Scoop or Large Spoon.*

5.8 *Balance, 0.1-g sensitivity.*

6. Sampling

6.1 Samples shall be taken in accordance with Practice D1799 or Practice D1900.

6.2 Practice D5817 shall be used for reduction and blending of samples.

7. Procedure

7.1 *Method A, Fines* and *Method B, Attrition*:

7.1.1 Stack up to six sets of sieves and receivers with a receiver beneath each sieve.

7.1.2 Weigh 25.0 g portions, being careful to dip approximately 25 g of black from the riffle splitter.

NOTE 1—It is not good practice to weigh the sample by pouring it directly out of the black container since the fines and smaller pellets will tend to remain in the container while the larger pellets pour out first. Dipping the black from the container is the preferred technique.

7.1.3 Transfer each sample to an individual 125-µm sieve.

NOTE 2—Six different materials or samples may be tested when all six sets of sieves are used. In some labs the position of the sieve may affect results with the higher sieves yielding higher fines data. For this reason the center position, sieves 3 and 4, should be used for referee testing.

7.1.4 Assemble up to six sets of sieves and receivers into a stack. Place a cover on top and transfer to the shaker. Tighten the shaker to eliminate any looseness. Refer to the user manual for operation of the vibratory sieve shaker. A vibratory amplitude of 1.3 mm should be selected with the vibratory sieve shakers operating at 3600 vpm. However, products that contain little or no binder may experience excessive attrition at the specified amplitude of 1.3 mm. It is the responsibility of the user to determine the appropriate amplitude for these products in order to match the Mechanical Sieve Shaker[3] values. It should be noted that changing the amplitude for standard products is not recommended and may result in erroneous values.

[3] A Mechanical Sieve Shaker or a vibratory sieve shaker is satisfactory for this purpose. For a description of these refer to Test Method D1511.

7.1.5 Start the shaker and allow to shake for 5 min with the hammer operating.

7.1.6 Remove the sieve assembly from the shaker and weigh the carbon black retained in each receiver to the nearest 0.1 g.

NOTE 3—To test only attrition, discard the fines without weighing.

7.2 *Method A, Fines*—If testing only fines, empty and clean thoroughly all sieves in preparation for the next test.

NOTE 4—If attrition is to be tested, retain the pellets on the sieve and discard the fines on the receiver. Proceed to Method B, Attrition.

7.3 *Method B, Attrition:*

7.3.1 Reassemble the sieves and transfer the stack back to the shaker. Shake for an additional 15 min with the hammer operating.

7.3.2 Remove the sieve assembly and weigh the carbon black retained on each receiver to the nearest 0.1 g.

7.3.3 Empty and clean thoroughly all sieves in preparation for the next test.

8. Calculation

8.1 Calculate the fines content to the nearest 0.1 % as follows:

$$F = (WF/S) \times 100 \quad (1)$$

8.2 Calculate attrition to the nearest 0.1 % as follows:

$$A = (WA/S) \times 100 \quad (2)$$

where:

A = attrition, %,
F = fines content, %,
WF = mass of carbon black in receiver after 5 min shake, g,
WA = mass of carbon black in receiver after additional 15 min shake, total 20 min g, and
S = mass of black tested, g.

9. Report

9.1 Report the following information:

9.1.1 Proper identification of the sample.

9.1.2 Time duration of shaking.

9.1.3 Results obtained, reported to the nearest 0.1 %.

10. Precision and Bias

10.1 These precision statements have been prepared in accordance with Practice D4483. Refer to this practice for terminology and other statistical details.

10.2 The precision results in this precision and bias section give an estimate of the precision for fines and attrition testing. The precision parameters should not be used for acceptance or rejection testing of any group of materials without documentation that they are applicable to those particular materials and the specific testing protocols of the test method.

10.3 A ~~Type 1 interlaboratory~~type 1 inter-laboratory precision program was conducted as detailed in ~~May~~Table 1 ~~1998.~~and Table 2 respectively. Both repeatability and reproducibility represent ~~short term testing conditions. Seven laboratories tested four carbon~~