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Designation: D1513 – 05$^{\varepsilon 1}$

Standard Test Method for Carbon Black, Pelleted—Pour Density[1]

This standard is issued under the fixed designation D1513; 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.

This standard has been approved for use by agencies of the Department of Defense.

ε^1 NOTE—Table 1 revised editorially in April 2010.

1. Scope

1.1 This test method covers the determination of the pour density of pelleted carbon blacks.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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:*[2]

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

3. Summary of Test Method

3.1 Pour density is determined by measuring the mass of carbon black in a known volume.

4. Significance and Use

4.1 Pour density is a function of the degree of compaction during pelletization. It is strongly influenced by and inversely proportional to structure (OAN). Pour density of carbon black is useful for estimating the weight-to-volume relationship for certain applications, such as automatic batch loading systems, and for estimating weights of bulk shipments.

5. Apparatus

5.1 *Cylindrical Container*, 1000 or 624-cm^3 capacity, having a uniform height and no pouring lip or deformation of the wall. A stainless steel beaker 100 ± 5 mm (4 ± 0.2 in.) in diameter is acceptable.

NOTE 1—A satisfactory container can be made by pouring 1000 or 624 cm^3 of water at 20°C into a 1000 or 1200-cm^3 stainless steel beaker 100 ± 5 mm (4 ± 0.2 in.) in diameter, marking the water level and then cutting at the mark after chucking firmly in a lathe.

5.2 *Straightedge or Spatula*, at least 150 mm (6 in.) in length.

5.3 *Balance*, torsion or trip, with a sensitivity of 0.1 g.

6. Sampling

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

7. Procedure

7.1 Pour the carbon black into the center of the tared container from a height not more than 50 mm (2 in.) above the rim. A large enough excess should be used to form a cone above the rim of the cylindrical container. Level the surface with a single sweep of the straightedge or spatula held perpendicular to and in firm contact with the lip of the container. Record the mass of the carbon black to the nearest gram.

8. Calculation

8.1 Calculate the pour density to the nearest kg/m^3 as follows:

8.1.1 Using a 1000-cm^3 container:

$$D = W_{1000} \quad (1)$$

8.1.2 Using a 624-cm^3 container:

[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.

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[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.

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TABLE 1 Test Method Precision—Type 1: Pour Density

Material	Mean Level kg/m³ (lb/ft³)	Within Laboratory[A]			Between Laboratory[A]		
		S_r	r	(r)	S_R	R	(R)
C	380 (23.8)	2.8 (0.18)	7.9 (0.50)	2.1	4.5 (0.28)	12.9 (0.80)	3.4
B	434 (27.1)	2.2 (0.14)	6.2 (0.39)	1.4	6.3 (0.39)	17.7 (1.11)	4.1
A	540 (33.7)	3.3 (0.20)	9.2 (0.57)	1.7	6.5 (0.41)	18.5 (1.16)	3.4
Pooled or Average values	452 (28.2)	2.8 (0.17)	7.9 (0.50)	1.7	5.9 (0.39)	16.6 (1.03)	3.7

[A] Symbols are defined as follows:
S_r = within laboratory standard deviation
r = repeatability in measurement units, kg/m³(lb/ft ³)
(r) = repeatability in percent
S_R = between laboratory standard deviation
R = reproducibility in measurement units, kg/m³(lb/ft³)
(R) = reproducibility in percent

$$D = (W_{624} \times 16)/10 \quad (2)$$

where:
D = pour density, kg/m³,
W_{1000} = mass of carbon black, g in 1000-cm³ container, and
W_{624} = mass of carbon black, g in 624-cm³ container.

8.2 Density to the nearest lb/ft³ can be calculated as follows:

8.2.1 Using a 1000-cm³ container:

$$d = D/16 = W_{1000}/16 \quad (3)$$

8.2.2 Using a 624-cm³ container:

$$d = D/16 = W_{624}/10 \quad (4)$$

where:
d = pour density, lb/ft³,
D = pour density, kg/m³,
W_{624} = mass of carbon black, g in 624-cm³ container, and
W_{1000} = mass of carbon black, g in 1000-cm³ container.

9. Report

9.1 Report the following information:

9.1.1 Proper identification of the sample, and

9.1.2 Result obtained, reported to the nearest kg/m³ (0.1 lb/ft³).

10. Precision and Bias

10.1 This precision and bias section has been prepared in accordance with Practice D4483. Refer to Practice D4483 for terminology and other statistical details.

10.2 *Precision*—The precision results in this section give an estimate of the precision as described in 10.3-10.5.2. The precision parameters should not be used for acceptance/rejection testing of any group of materials without documentation that they are applicable to those particular materials and the specific testing protocols that include this test method.

10.3 A Type 1 interlaboratory precision program was conducted in 1994. Both repeatability and reproducibility represent short-term testing conditions. Nine laboratories tested three carbon blacks (Materials A, B, and C) twice on two different days. A test result is the value obtained from a single determination. Acceptable difference values were not measured.

10.4 The results of the precision calculations are given in Table 1, with the materials arranged in ascending "mean level" order.

10.5 The precision for the pooled values for pour density may be expressed as follows:

10.5.1 *Repeatability*—The repeatability, (r), of the pour density has been established as 1.7 % (pooled). Two single test results (or determinations) that differ by more than 1.7 % must be considered suspect and dictate that some appropriate investigative action be taken.

10.5.2 *Reproducibility*—The reproducibility, (R), of the pour density has been established as 3.7 % (pooled). Two single test results (or determinations) produced in separate laboratories that differ by more than 3.7 % must be considered suspect and dictate that some appropriate investigative or technical/commercial action be taken.

10.6 *Bias*—In test method terminology, bias is the difference between an average test value and the reference (true) test property value. Reference values do not exist for this test method since the value or level of the test property is exclusively defined by the test method. Bias, therefore, cannot be determined.

11. Keywords

11.1 carbon black; estimating mass of bulk shipments; mass to volume relationships; pelleted carbon black; pour density

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