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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Carbon Black—Relative Extrusion Mass[1]

This standard is issued under the fixed designation D 3674; 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.

ε1 NOTE—Keywords were added editorially in December 1993.

1. Scope

1.1 This test method covers the determination of the relative extrusion mass of a carbon black sample compounded in a styrene-butadiene rubber (SBR) compound recipe. A sample of the current industry reference black (IRB) and the sample to be tested are both compounded and extruded in the same manner in accordance with Test Methods D 3191. The mass of a 1-m (39.37-in.) length extrusion of each sample is measured, and the relative extrusion mass of the tested sample is expressed as a percent of the mass of the extrusion containing IRB.

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

1.3 *This standard does not purport to address all of the safety problems, 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 1799 Practice for Carbon Black—Sampling Packaged Shipments[2]

D 1900 Practice for Carbon Black—Sampling Bulk Shipment[2]

D 3051 Practice for Carbon Black—Stating the Precision of ASTM Test Methods[2]

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets[2]

D 3191 Test Methods for Carbon Black Evaluation in SBR (Styrene-Butadiene Rubber)[2]

D 3396 Practice for Carbon Black—Measuring the Precision of ASTM Test Methods[2]

3. Significance and Use

3.1 In practice, rubber compounds swell as they leave extrusion dies. For compounds differing only in the type of carbon black, the amount of swelling is influenced by the morphological characteristics of the carbon black. This test method permits a comparison of various samples of carbon black for these morphological characteristics.

4. Apparatus

4.1 *Mixing Mill,* as described in Practice D 3182.

4.2 *Extruder,* screw-type, having a compression ratio of 1:1, with cylindrical extrusion die as shown in Fig. 1. The distance between the end of the screw and the land of the die shall be from 1 to 2 times the diameter of the screw, and the ratio of the length to diameter of the screw shall be 5:1 or greater. The use of breaker plates, screens, or spiders in the extruder is not recommended.

4.2.1 The extruder shall be equipped with devices capable of monitoring the temperature of the barrel, the head, the discharged heating fluid from the screw, and the surface of the die. These monitoring devices shall have a sensitivity of 0.5°C or less.

4.3 *Scale or Balance,* 500-g capacity, 0.01-g sensitivity.

4.4 *Oven,* gravity-convection type, capable of temperature regulation within ±1°C at 125°C and temperature uniformity within ±5°C.

4.5 *Metal Cooling Table,* approximately 0.8 m (30 in.) wide by 1.2 m (48 in.) long, with a smooth, flat surface lightly dusted with zinc stearate or talc powder.

4.6 *Metre Stick or Jig,* for measuring or cutting uniform 1-m (39.37-in.) lengths, or both.

4.7 *Belt Conveyor,* motor driven with a belt at least 150 mm (6 in.) wide and 1.5 m (5 ft) long, and variable in speed up to 75 mm/s (15 ft/min).

NOTE 1—It is not mandatory to use a belt conveyor to obtain reliable test data.

5. Materials and Manufacture

5.1 The materials as described in Test Methods D 3191 shall be used.

5.2 The current lot of industry reference black shall be used in the standard compound.

6. Sampling

6.1 Take samples in accordance with Practices D 1799 and D 1900.

7. Procedure

7.1 Prepare and mix the IRB and all carbon black samples in accordance with Practice D 3182 and Test Methods D 3191.

7.1.1 Cut the stock from the main batch into strips approximately as wide as the extruder feed hopper in accordance with Test Methods D 3191. Cut enough stock to produce an extrusion approximately 4.5 m (15 ft) long, while maintaining a full extruder.

7.2 Condition the stock for a minimum of 1 h and a

[1] This test method is under the jurisdiction of ASTM Committee D-24 on Carbon Black and is the direct responsibility of Subcommittee D24.71 on Methods of Testing Carbon Black in Rubber.

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[2] *Annual Book of ASTM Standards,* Vol 09.01.