Designation: D4570 – 02 (Reapproved 2017)

Standard Test Method for Rubber Chemicals—Determination of Particle Size of Sulfur by Sieving (Dry)[1]

This standard is issued under the fixed designation D4570; 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 particle size measurement of the coarse fraction of ground sulfurs. It is limited to measurement of particles greater than 45 µm (No. 325 sieve). If the sulfur is very fine and the screens become plugged by the caking of the sulfur, it may be necessary to use a wet sieve procedure instead.

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

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]

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E145 Specification for Gravity-Convection and Forced-Ventilation Ovens

3. Significance and Use

3.1 This test method is used to evaluate sulfur for suitability as a rubber vulcanizing agent. Sulfur particles must be small enough to dissolve in rubber during cure to produce a uniform network of cross-links. This test method is used as a quality control method to ensure that large particles are not present (*and to determine if the sulfur follows a typical pattern for size distribution*).

4. Apparatus

4.1 *Standard Sieves,* stainless steel, 203 mm in diameter conforming to Specification E11. The stainless steel cloth shall range in mesh size from 45 to 250 µm. The sieve set should include a lid and a bottom pan.

4.2 *Mechanical Sieve Shakers,* such as a Tyler Ro-Tap[3] or equivalent unit.

4.3 *Balance,* with a minimum capacity of 500 g sensitive to 0.1 g.

4.4 *Balance,* with a minimum capacity of 150 g sensitive to 0.001 g.

4.5 *Oven,* circulating air type, controlled to 70 ± 2°C.

5. Reagent

5.1 *Tri-calcium Phosphate,* screened to a fineness of less than 45 µm.

6. Procedure

6.1 Weigh each sieve to the nearest 0.1 g and assemble in order of increasing mesh size from bottom to top. Add a bottom pan. Choice of sieves depends on the information desired.

6.2 Into a beaker or suitable container, weigh precisely 100.0 g of sulfur to the nearest 0.1 g. When the sulfur is very fine, add 2.0 g of tri-calcium phosphate (see 5.1) and blend thoroughly using a spatula.

6.3 Transfer all the sulfur to the top sieve and add the lid. Fix the sieve vest firmly in the mechanical sieve shaker. Run the unit for 10 min, stop, remove the sieves, and weigh each sieve to the nearest 0.1 g. Return the sieves to the unit and run an additional 3 min. Reweigh each sieve again to the nearest 0.1 g. Repeat until the sieves reach constant mass.

7. Calculation

7.1 Determine the residue remaining on each sieve by mass difference. For higher precision, transfer the small residue from the coarser screen to a weighing dish and weigh to the nearest 0.01 g.

[1] This test method is under the jurisdiction of ASTM Committee D11 on Rubber and Rubber-like Materials and is the direct responsibility of Subcommittee D11.20 on Compounding Materials and Procedures.

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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.

[3] This unit may be purchased from the Fisher Scientific Co., 585 Alpha Dr., Pittsburgh, PA 15238.

7.2 The percent residue on each screen is equal to the amount in grams on each screen.

7.3 The percent residue passing through each screen is determined by accumulating the total percent material collected on that screen and the coarser screens used and subtracting the total from 100.

% residue through (for any screen) =

100 – sumation of % sulfur collected on that screen and on any coarser screens

8. Report

8.1 The report should include the following information:

8.1.1 Proper identification of samples,

8.1.2 Identification of each screen used,

8.1.3 The percent residue on each screen, and

8.1.4 The percent residue through for each screen.

9. Precision and Bias

9.1 Round robin testing will be conducted, and precision and bias statements will be balloted for inclusion upon the completion of this work.

10. Keywords

10.1 dry sieving; particle size; sulfur