Designation: C371 – 09 (Reapproved 2014)

Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders[1]

This standard is issued under the fixed designation C371; 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 particle size distribution of nonplastic ceramic powders such as alumina, silica, feldspar, pyrophyllite, nepheline syenite, talc, titanates, and zircon using wire cloth sieves.

1.2 Materials containing a large amount of fines, containing agglomerates, or that are nonfree-flowing, are wet-sieved to remove excessive fines or to disperse agglomerates before performing the test. This technique is not applicable to materials that are, to any degree, water soluble.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units, or are other customary units (in the case of sieve frame diameter and sieve number), that are provided for information only and are not considered 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C322 Practice for Sampling Ceramic Whiteware Clays

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Significance and Use

3.1 Sieve analyses are carried out to determine the particle size distribution of powders which, in turn, are used to qualify those materials as to their usefulness in the process under consideration. Since particle size analyses have only relative significance, the results should be considered only where they correlate with process characteristics. The parameter that is being measured in this test is the amount of material that will pass through a cloth having theoretically square openings. It must be remembered that all the holes are not square, nor uniform in size, and the question of whether a given particle will go through is a statistical one. Since each particle size analysis method measures a unique physical parameter, the results from one method may not agree with those from another. Particle size distributions play a role in such properties as bulk density, dustiness, and handling characteristics. Care should be taken, however, when interpretations are made from one or two points (sieves) on the distribution curve.

4. Apparatus

4.1 *Balance,* having a sensitivity of 0.05 g.

4.2 *Sieves,* clean, unblinded, 205 mm (8 in.) in diameter, and conforming to Specification E11. At all times they shall be certified by, or shall be calibrated with sieves certified by, the National Institute of Standards and Technology. For wet-sieving, use full-height 50-mm (2-in.) sieves; these sieves and pan may be used for dry-sieving also. Half-height 25-mm (1-in.) sieves and pan shall be used for dry-sieving only. The sieves to be used may range from 45 μm (No. 325) through 212 μm (No. 70).

4.3 *Drying Pans,* about 205 mm (8 in.) in diameter and 25 or 50 mm (1 or 2 in.) high.

4.4 *Dryer*—For drying, the use of an oven maintained automatically at 100 to 110°C is recommended.

4.5 *Mechanical Shaking Device*—The shaking device shall be such as to produce a lateral and vertical motion of the sieve, accompanied by a jarring action so as to keep the sample moving continuously over the surface of the sieve.

4.6 In wet-sieving, the water should be slightly above room temperature (for example, a hot-cold mixer tap) and should be supplied by means of a fixed or hand-held spray.

5. Sampling

5.1 *Unit for Sampling*—Each carload shall be considered a unit for sampling.

5.2 *Gross Sample* (See Practice C322)—In collecting the gross sample from a carload shipped in bags, select a number of bags equivalent to not less than 1 % of the total number of

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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.

***A Summary of Changes section appears at the end of this standard**

bags in the car. Bags taken for sampling shall be from locations evenly distributed, horizontally and vertically, throughout the car. The gross sample shall consist of equal increments of not less than 227 g (0.5 lbs) from each of the bags taken for sampling. In collecting the gross sample from a carload shipped in bulk, take equal increments of not less than 227 g each from points well distributed both horizontally and vertically.

5.3 *Test Sample*—Obtain the test sample, of not less than 110 g, by mixing the gross sample and then riffling or hand quartering. Dry the entire test sample in an oven at 100 to 110°C to constant weight. Take a 100-g (Note 1) specimen weighed to the nearest 0.1 g shall be taken for sieve analysis.

NOTE 1—Alternatively, if less than 50 % passes the finest sieve, use a 50-g specimen.

6. Procedure

6.1 Transfer the 100-g specimen to glazed paper and proceed to 6.5, except as noted in 6.2.

6.2 Alumina, talc, pyrophillite, other nonfree-flowing materials, and those materials containing agglomerates require a preliminary wet sieving. Place the 100-g specimen into a glass beaker. Add 200 g of distilled water together with a suitable dispersion agent (Note 2) and stir the suspension with a rod until complete dispersion is obtained (Note 3). Pour the suspension onto the finest sieve to be used. Wash any residue in the beaker onto the sieve with a wash bottle.

NOTE 2—One suitable dispersion agent is 0.1 % sodium pyrophosphate. A 0.1 % sodium hexametaphosphate should be used for alumina.

NOTE 3—Dispersion aids, such as ultrasonic vibration and high shear mixers (food blenders) may be necessary to eliminate agglomerates. Care must be taken that undesirable grinding does not take place.

6.3 While agitating, thoroughly wash the sieve under the sprayer head, the flow being sufficiently gentle to avoid splashing. Sieving is complete when no more material passes. Determine this by catching the washings and examining for the solids.

6.4 When sieving is complete, pass a sponge over the underside of the sieve-cloth to draw out as much of the water as possible. Rinse the retained solids with acetone, to speed up drying, and dry off any excess with a sponge. Do this thoroughly to avoid dangerous levels of acetone in the oven. Dry the sieve and specimen thoroughly at 100 to 110°C and then brush onto glazed paper.

6.5 Assemble all the sieves to be used in the test with the coarsest sieve on top and the others under it in order of decreasing sieve opening size. Transfer the specimen from the glazed paper to the top or coarsest sieve and shake the entire series of sieves. It is recommended that this agitation be done mechanically. For hand-sieving, hold the nest of sieves, with pan and cover attached, in one hand and gently strike the side about 150 times/min against the palm of the other hand. The side of sieves next to the striking hand should be slightly higher than the other side so that sample will be well distributed over sieves. Turn the sieve-nest every 25 strokes about one sixth of a revolution in the same direction. With either mechanical or hand agitation, the agitation should continue to the point where not more than 0.05 g passes a given sieve in 1 min.

6.6 Separate the nested sieves and carefully remove the residue from each and weigh to the nearest 0.1 g. These weights in grams will equal the percent of residue on each sieve (if a 100-g specimen was used).

7. Calculation and Report

7.1 Calculate and report the cumulative percent passing, or the residue on each sieve, as required, to the nearest whole percent.

8. Precision and Bias

8.1 *Precision*—The precision of the procedure in Test Method C371 for measuring particle size is being determined.

8.2 *Bias*—The true value of the particle size can only be defined in terms of a test method. Within this limitation, this method has no known bias.

9. Keywords

9.1 alumina; particle size distribution; sieve analysis; silica; wet-sieving

SUMMARY OF CHANGES

Committee C21 has identified the location of selected changes to this standard since the last issue (C371–89 (2003)) that may impact the use of this standard.

(1) Addition of 1.3 describing the use of units in this test method, with renumbering of the subsequent sections of the Scope.