Designation: C1182 – 09

StandardTest Method for Determining the Particle Size Distribution of Alumina by Centrifugal Photosedimentation[1]

This standard is issued under the fixed designation C1182; 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 alumina in the range from 0.1 to 20 μm having a median particle diameter from 0.5 to 5.0 μm.

1.2 The procedure described in this test method may be successfully applied to other ceramic powders in this general size range. It is the responsibility of the user to determine the applicability of this test method to other material.

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

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]

C242 Terminology of Ceramic Whitewares and Related Products

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

3. Terminology

3.1 *Definitions:*

3.1.1 Refer to Terminology C242 for definitions of terms used in this test method.

4. Summary of Test Method

4.1 A homogeneous aqueous dispersion of the powder is prepared. While kept in a thoroughly mixed condition, a small aliquot is transferred to the analyzer sample cell, which is placed in the instrument and subjected to a controlled centrifugal acceleration at a known or controlled temperature. At predetermined times related to the sedimentation of specific Stokes' diameters (Note 1), the optical absorbance is recorded and ratioed to the initial value to determine the fraction of the total sample that has sedimented a specific distance. A volume based size distribution is calculated from the absorbance-time data. Since alumina particles are not truly spherical, the results are reported as *equivalent diameters (spherical)* (Note 2).

NOTE 1—This diameter in micrometres is referred to as D in the equation:

$$D^2 = \frac{18\,n\,(H/t)}{(\rho_s - \rho_f)u^2} \times 10^8 \quad (1)$$

where:

n = viscosity of the fluid, P,
H = height of the settling particles, cm,
t = time for particle to settle, s,
ρ_s = particle density, g/cm^3,
ρ_f = fluid density, g/cm^3, and
u = the rotational velocity, cm/s.

NOTE 2—Refer to Terminology C242 for the ASTM definition of this term. Most equipment manufacturers refer to this as the equivalent spherical diameter.

4.2 The instruments that have been found suitable for this test method incorporate microcomputers that control instrument operation and perform all required data acquisition and computation functions.

5. Significance and Use

5.1 Manufacturers and users of alumina powders will find this test method useful to determine the particle size distribution of these materials for product specification, quality control, and research and development testing.

6. Apparatus

6.1 *Centrifugal Particle Size Distribution Analyzer*—The analyzer shall incorporate a centrifuge capable of subjecting a

[1] This test method is under the jurisdiction of ASTM Committee C21 on Ceramic Whitewares and Related Products and is the direct responsibility of Subcommittee C21.04 on Raw Materials.

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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**