



Designation: C 690 – 03

Standard Test Method for Particle Size Distribution of Alumina or Quartz Powders by Electrical Sensing Zone Technique¹

This standard is issued under the fixed designation C 690; 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, one of several found valuable for the measurement of particle size, covers the determination of the particle size distribution of alumina or quartz powders (0.6 to 56.0 μm) using electrical sensing zone particle size analyzers. These instruments use an electric current path of small dimensions which is modulated by individual particle passage through an aperture, and produces individual pulses of amplitude proportional to the particle volume.

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 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. Summary of Test Method

2.1 A carefully dispersed, dilute suspension of the powder in a beaker filled with an electrolyte is placed on the instrument sample stand. The suspension is forced through a restricting aperture. Each particle passing generates an electric pulse that is recorded on an electronic counter.

2.2 The instrument response is essentially related to particle volume (liquid displacement). Equivalent spherical diameter is commonly used to express the particle size. (Comparisons with other techniques have been found to be good for spherical particles; for non-spherical particles results may differ.)

3. Significance and Use

3.1 This test method is useful to both sellers and purchasers of alumina and quartz powders for determining particle size distributions for materials specifications, manufacturing control, and development and research.

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 C21.07 on Nonplastics.

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4. Apparatus

4.1 *Electrical Sensing Zone Particle Counter*. Coulter Counter Models MSII, MS IIe, and MS 3²

4.2 *Aperture Tubes*, diameter ranging from approximately 30 to 140 μm . The diameter required is dependent upon the particle size distribution of the sample. Generally any given tube will cover a particle size range from 2 to 60 % of its aperture diameter.

NOTE 1—In certain cases, apertures up to 280 μm are usable.

4.3 *Sample Beaker*, capable of maintaining all particles uniformly in suspension (for example, round-bottom).

4.4 *Blender*, capacity 1-L glass container. A means to control speed is required.

4.5 *Beakers*, 100, 500, and 1000-mL.

4.6 *Pipet*.

4.7 *Wash Bottles*.

4.8 *Membrane Filtering Device*, rated at 0.45- μm filters or finer.³

5. Reagents

5.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

² The sole source of supply of the apparatus known to the committee at this time is Beckman Coulter, Inc., Miami, FL 33196. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee², which you may attend.

³ The membrane filters may be the Millipore, Pall metal type, or other equivalent.

⁴ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, VWR International Ltd., U.K., and the *United States Pharmacopoeia*, USPC, Rockville, MD..