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Standard Specification for Aluminum Oxide Powder[1]

This standard is issued under the fixed designation F7; 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 specification covers aluminum oxide (alumina) powder in two classes of particle size, two chemical grades, and two levels of acidity, for use as an insulating coating or as an ingredient of ceramic mixtures for components of electronic devices as follows:

1.1.1 *Particle Sizes:*

1.1.1.1 *Class A*—Particle size No. 500 nominal mesh (nominal average particle size = 24.3 µm).

1.1.1.2 *Class B*—Particle size No. 900 nominal mesh (nominal average particle size = 1.7 µm).

1.1.2 *Chemical Grades*—Grades 1 and 2 as specified under chemical requirements in Section 3.

1.1.3 *Acidity Levels*: pH (acid) 4.5 to 6.5 and pH (neutral) 6.5 to 7.5.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 The following safety hazards caveat pertains only to the test methods in this specification. *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]

C183 Practice for Sampling and the Amount of Testing of Hydraulic Cement

E70 Test Method for pH of Aqueous Solutions With the Glass Electrode

3. Chemical Composition

3.1 For a specified particle size and level of acidity, the aluminum oxide shall conform to the requirements of Table 1 as to chemical composition.

4. Physical Properties

4.1 The alumina shall be "chalk white," dry, free from lumps, and of particle size distribution as agreed upon between purchaser and seller.

5. Sampling

5.1 Each lot of alumina shall be properly sampled in accordance with standard techniques, such as Practice C183.

6. Test Methods

6.1 *Water-Soluble Content:*

6.1.1 *Procedure*—Determine the total water-soluble content by measuring the electrical conductivity of a 100-mL distilled or deionized water extract from a 5-g sample of alumina. Elutriate by vigorously shaking the alumina suspension in a flask for 1 to 2 min, allowing the solids to settle and decanting the clear supernatant liquid after 60 min. Measure the conductivity of the liquid with a standard cell and bridge. Correct this measurement for the "blank" reading on a similarly treated equal volume of the same pure water. Convert the net increase in conductivity of the water extract first to parts of water-soluble content as sodium chloride (NaCl) per million parts of water (factor is 1 micromho = 0.5 ppm NaCl), then relate to the actual weight of elutriated alumina. For example, on a typical 100-mL extract 10 micromhos (net) or 5 parts of NaCl per million of water in this volume of liquid is equivalent to 100 parts of NaCl per million of alumina on the basis of a 5-g sample.

6.1.2 *Calculation*— Determine the parts per million of water-soluble content as follows:

$$\text{ppm} = 10^7 K_c\left[\left(R_b - R_x\right)/R_b R_x\right] \quad (1)$$

where:

K_c = cell constant, cm^{-1},
R_b = specific resistance of test water, Ω·cm, and
R_x = specific resistance of alumina extract in test water, Ω·cm.

6.2 *Particle Size:*

[1] This specification is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.03 on Metallic Materials, Wire Bonding, and Flip Chip.

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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.