



Designation: C 1031 – 97

Standard Specification for Nuclear-Grade Aluminum Oxide Powder¹

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1. Scope

1.1 This specification provides the chemical and physical requirements for nuclear-grade aluminum oxide powder intended for fabrication into shapes for nuclear applications. Two specific uses for which this powder is intended are Al_2O_3 pellets and $\text{Al}_2\text{O}_3 - \text{B}_4\text{C}$ composite pellets for use as thermal insulator or burnable neutron absorbers.

1.2 The material described herein shall be particulate in nature.

2. Referenced Documents

2.1 ASTM Standards:

C 809 Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Aluminum Oxide and Aluminum Oxide-Boron Carbide Composite Pellets²

C 859 Terminology Relating to Nuclear Materials²

E 105 Practice for Probability Sampling of Materials³

2.2 ANSI Standard:

ANSI/ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facility Applications⁴

2.3 U.S. Government Document:

Code of Federal Regulations, Title 10, Part 50—Energy (10CFR 50), Domestic Licensing of Production and Utilization Facilities⁵

3. Terminology

3.1 *Descriptions of Terms Specific to This Standard*—Terms shall be defined in accordance with Terminology C 859 except for the following:

¹ This specification is under the jurisdiction of ASTM Committee C-26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.03 on Neutron Absorber Materials Specifications.

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² *Annual Book of ASTM Standards*, Vol 12.01.

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ Available from the American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁵ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

3.1.1 *buyer*—organization issuing the purchase order.

3.1.2 *powder lot*—that quantity of aluminum oxide powder made up of powder from one or more sources, blended together such that samples taken in accordance with the procedures in Section 8 can be considered as representative of the entire quantity.

3.1.3 *seller*—aluminum oxide manufacturer.

4. Ordering Information

4.1 The buyer shall specify the following information on the order:

4.1.1 Quantity (weight of delivered product),

4.1.2 Lot size (allowable range), and

4.1.3 Sample requirements.

4.2 The particle size distribution will be determined utilizing a method agreed upon between buyer and seller.

5. Chemical Composition

5.1 The powder shall conform to the following chemical requirements (see Methods C 809):

Element	Weight %, max
Silicon	2.0
Iron-Chromium-Nickel	0.6
Magnesium	1.0
Sodium	0.2
Calcium	0.3
Hafnium	200 $\mu\text{g/g Al}_2\text{O}_3$
Fluorine	50 $\mu\text{g/g Al}_2\text{O}_3$
Fluorine-Chlorine-Iodine-Bromine	100 $\mu\text{g/g Al}_2\text{O}_3$
Gadolinium	100 $\mu\text{g/g Al}_2\text{O}_3$
Samarium	100 $\mu\text{g/g Al}_2\text{O}_3$
Europium	100 $\mu\text{g/g Al}_2\text{O}_3$
Dysprosium	200 $\mu\text{g/g Al}_2\text{O}_3$

5.2 Any identified impurity exceeding 1.0 weight % shall be reported. The total of all measured impurities shall not exceed 4.0 weight %.

NOTE 1—The buyer may specify limits for any other elements (for example, neutron absorbing materials, such as boron) not listed in 5.1.