



Designation: C 785 – 93^{ε1}

Standard Specification for Nuclear-Grade Aluminum Oxide Pellets¹

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^{ε1} NOTE—Paragraphs 5.1.2 and 12.1 were corrected editorially in March 1994.

1. Scope

1.1 This specification applies to pellets of aluminum oxide that may be ultimately used in a reactor core design, for example, as filler or spacers within fuel, burnable poison, or control rods. In order to distinguish between the subject pellets and “burnable poison” pellets, it is established that the subject pellets are not intended to be used as neutron-absorbing material.

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

2. Referenced Documents

2.1 ASTM Standards:

C 559 Test Method for Bulk Density by Physical Measurements of Manufactured Carbon and Graphite Articles²

C 809 Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Aluminum Oxide and Aluminum Oxide-Boron Carbide Composite Pellets³

C 859 Terminology Relating to Nuclear Materials³

E 105 Practice for Probability Sampling of Materials⁴

2.2 ANSI Standard:

ANSI/ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facilities⁵

2.3 U.S. Government Document:

Code of Federal Regulations, Title 10, Part 50, Energy (10CFR50) Domestic Licensing of Production and Utilization Facilities⁶

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 15.01.

³ Annual Book of ASTM Standards, Vol 12.01.

⁴ Annual Book of ASTM Standards, Vol 14.02.

⁵ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁶ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

3. Terminology

3.1 *Definitions*—Terms shall be defined in accordance with Terminology C 859 except for the following:

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *buyer*—organization issuing the purchase order.

3.2.2 *pellet*—fabricated geometric shape of aluminum oxide having a chemical composition as described in Section 4.

3.2.3 *pellet lot*—that quantity of pellets produced from one aluminum oxide powder lot using one set of process parameters whose limits have been agreed upon between the seller and the buyer.

3.2.4 *powder lot*—a specified quantity of aluminum oxide powder made up of powders from one or more sources blended together such that samples taken in accordance with 7.1 can be considered as representative of the entire specified quantity.

3.2.5 *seller*—aluminum oxide pellet supplier.

4. Chemical Composition

4.1 Use analytical chemistry methods in accordance with Methods C 809 or demonstrated alternate methods agreed upon between the buyer and the seller.

4.2 The finished aluminum oxide pellets shall conform to the following chemical analysis:

B ₂ O ₃ + boric acid	0.01 weight % max
Si	2.0 weight % max
Fe + Cr + Ni	0.6 weight % max
Mg	1.0 weight % max
Na	0.2 weight % max
Ca	0.3 weight % max
Hf	200 µg/g pellet max
F	50 µg/g pellet max
F + Cl + I + Br	100 µg/g pellet max

Any element impurity not listed in 4.2 shall not exceed 1 weight % as determined by emission spectroscopy. The sum of all impurities shall not exceed 4.0 weight %.

4.2.1 The total equivalent boron content (EBC) of the finished aluminum oxide pellets shall not exceed 400 mg/g on a pellet weight basis. The total EBC is the sum of the individual EBC values. Table 1 is a list of elements to be considered in calculating the total EBC. The EBC of each impurity element shall be calculated individually using the following equation: