



Designation: ~~C1098-93~~ Designation: C 1098 – 08

## Standard Specification for Nuclear-Grade Hafnium Oxide Powder<sup>1</sup>

This standard is issued under the fixed designation C 1098; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification defines the physical and chemical requirements for hafnium oxide powder intended for fabrication into shapes for use in a nuclear reactor core.

1.2 The material described herein shall be particulate in nature.

~~1.3 The values stated in SI units are to be regarded as the standard.~~

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

### 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

C 117 [Test Method for Materials Finer Than 75- \$\mu\$ m than 75- \$\mu\$ m \(No. 200\) Sieve in Mineral Aggregates by Washing](#)

C 371 [Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders](#)

C 859 [Terminology Relating to Nuclear Materials](#)

E 11 [Specification for Wire-Cloth Sieves for Testing Purposes](#)—Specification for Wire Cloth and Sieves for Testing Purposes

E 105 [Practice for Probability Sampling of Materials](#)

2.2 *ANSI/ASME Standard*:

NQA-1 [Quality Assurance Program Requirements for Nuclear Facilities](#)—ASME Quality Assurance Program Requirements for Nuclear Facility Applications<sup>3</sup>

2.3 *U.S. Government Standard*:

Code of Federal Regulations, Title 10, Part 50, Energy (10 CFR 50), Domestic Licensing of Production and Utilization Facilities<sup>4</sup>

### 3. Terminology

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

3.2 *buyer*—the organization issuing the purchase order.

3.3 *hafnium oxide powder*—hafnium oxide that contains no hard aggregates larger than 20 mesh (840  $\mu$ m).

3.4 *phase transformation*—the rearrangement of the atomic ordering of a crystalline lattice as material is cycled through a critical transformation or inversion temperature; the change from one crystalline phase to another may be accompanied by a volume change that could lead to cracks or defects in products fabricated from such materials.<sup>5, 6</sup>

3.5 *powder lot*—a specified quantity of hafnium oxide powder (with stabilizing additive, if applicable) blended together such that samples taken in accordance with the procedures of Section 8 can be considered as representative of the entire quantity.

<sup>1</sup> 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.

Current edition approved April 15, 1993. Published June 1993. Originally published as C1098-88. Last previous edition C1098-88.

<sup>2</sup> This specification is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.03 on Neutron Absorber Materials Specifications.

Current edition approved Dec. 1, 2008. Published January 2009. Originally approved in 1988. Last previous edition approved in 1993 as C 1098 – 93 which was withdrawn June 2002 and reinstated in January 2009.

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards*, Vol 04.02, volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>4</sup> Annual Book of ASTM Standards, Vol 15.02.

<sup>5</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

<sup>6</sup> Annual Book of ASTM Standards, Vol 12.01.

<sup>7</sup> Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

<sup>8</sup> Annual Book of ASTM Standards, Vol 14.02.

<sup>9</sup> Curtis, C. E., Doney, L. M., and Johnson, J. R., "Some Properties of Hafnium Oxide, Hafnium Silicate, Calcium Hafnate, and Hafnium Carbide," *Journal of American Ceramic Society*, Vol 37, 1954, pp. 458-465.

<sup>10</sup> Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

<sup>11</sup> Brown, L. M., and Mazdiyasi, K. S., "Characterization of Alkoxy-Derived Ytria-Stabilized Hafnia," *Journal of American Ceramic Society*, Vol 53, 1970, pp. 590-594.