



Designation: ~~C1462–00 (Reapproved 2013)~~ C1462 – 21

Standard Specification for Uranium Metal Enriched to ~~More than 15 % and Less Than~~ 20 % ²³⁵U¹

This standard is issued under the fixed designation C1462; 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 nuclear grade uranium metal that has either been processed through an enrichment plant, or has been produced by the blending of highly enriched uranium with other uranium, to obtain uranium of any ²³⁵U concentration ~~mass fraction below 20 % (and greater than 15 %)~~ and that is intended for research reactor and generation IV nuclear reactor fuel fabrication. The scope of this specification includes specifications for enriched uranium metal derived from commercial natural uranium, ~~recovered/reprocessed~~ uranium, or highly enriched uranium. Commercial natural uranium, ~~recovered/reprocessed~~ uranium and highly enriched uranium are defined in Section 3. The objectives of this specification are to define the impurity and uranium isotope limits for commercial grade enriched uranium metal.

1.2 This specification is intended to provide the nuclear industry with a standard for enriched uranium metal which is to be used in the production of research reactor and generation IV nuclear reactor fuel. In addition to this specification, the parties concerned may agree to other appropriate conditions.

1.3 The scope of this specification does not comprehensively cover all provisions for preventing criticality accidents or requirements for health and safety or for shipping. Observance of this standard does not relieve the user of the obligation to conform to all applicable international, federal, state, and local regulations for processing, shipping, or any other way of using uranium metal (see, for example, ~~C996~~ regarding references).

1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[C696 Test Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Uranium Dioxide Powders and Pellets](#)

¹ This specification is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.02 on Fuel and Fertile Material Specifications.

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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.

C799 Test Methods for Chemical, Mass Spectrometric, Spectrochemical, Nuclear, and Radiochemical Analysis of Nuclear-Grade Uranyl Nitrate Solutions

C859 Terminology Relating to Nuclear Materials

C996 Specification for Uranium Hexafluoride Enriched to Less Than 5 % ²³⁵U

C1233 Practice for Determining Equivalent Boron Contents of Nuclear Materials

C1295 Test Method for Gamma Energy Emission from Fission and Decay Products in Uranium Hexafluoride and Uranyl Nitrate Solution

C1347 Practice for Preparation and Dissolution of Uranium Materials for Analysis

2.2 ANSI Standard³

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

2.3 U.S. Government Documents⁴

Code of Federal Regulations, Title 10, Part 50, (Appendix B)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 ~~Definitions of Terms Specific to This Standard—Terms—Terms~~ shall be defined in accordance with Terminology C859, except for the following:

3.1.2 ~~commercial grade enriched uranium metal—metal, n—~~uranium metal derived from commercial natural uranium, ~~recovered~~reprocessed uranium, or uranium obtained from the blending of highly enriched uranium with commercial natural uranium, ~~recovered~~reprocessed uranium, or depleted uranium.

3.1.3 ~~commercial natural uranium—uranium, n—~~any form of natural unirradiated uranium (containing ~~0.711~~+0.711 g ± 0.004 g ²³⁵U per ~~100 g~~100 g U).

3.1.4 ~~depleted uranium—uranium, n—~~any form of unirradiated uranium with a ²³⁵U ~~content~~mass fraction less than commercial natural uranium.

3.1.5 ~~highly enriched uranium—uranium, n—~~any form of uranium having a ²³⁵U ~~content~~mass fraction equal to or in excess of 20 %.

3.1.6 ~~recovered uranium—reprocessed uranium, n—~~any form of uranium that has been exposed in a neutron irradiation facility and either has been subsequently chemically separated from the fission products and transuranic isotopes so generated, or may be used as is, due to low irradiation levels.

3.1.6.1 Discussion—

The requirements for ~~recovered~~reprocessed uranium are intended to be typical of reprocessed spent fuel from research reactors that have achieved burn-up levels of up to 50 % of the originally contained fissile material or may have been utilized in critical facilities. It is recognized that different limits would be necessary to accommodate different fuel histories.

3.1.7 For enriched uranium metal transactions, “buyer” usually represents the research reactor operator or the fuel fabricator, and “seller” usually represents the supplier of the enriched uranium metal.

4. Health Physics Requirements

4.1 For commercial grade enriched uranium metal, the gamma activity from fission products shall not exceed 600 Bq/gU. The measurements are to be made by Test Method C1295 or equivalent. ~~See~~(See Note 1.)

NOTE 1—Depending upon the requirements of the fabricator utilizing enriched uranium metal, gamma activity from fission products as high as 6,000 Bq/gU may be acceptable, due to the utilization of reprocessed enriched uranium in producing the enriched uranium metal.

4.2 For commercial grade enriched uranium metal, the total alpha activity from transuranium elements per gram of uranium shall be less than 250 Bq/gU.Bq.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ 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>.

5. Chemical, Physical, and Isotopic Requirements

5.1 *Physical Requirements:*

5.1.1 The uranium ~~content~~ mass fraction of commercial grade enriched uranium metal shall be greater than or equal to ~~99.85 weight percent~~ 99.85 %.

5.1.2 The product shall be supplied as spherical, cubical, ~~cylindrical or broken pieces, with dimensions of not more than 40 mm or less than 10 mm.~~ The cylindrical, or broken pieces. Dimensional requirements shall be agreed upon between the buyer and the seller. Requirements for the mass of individual pieces shall be between 130 and 300 g, agreed upon between the buyer and the seller.

5.1.3 The individual pieces of product shall be free of loose or excessive oxides or contaminants. A tightly adhering oxide film is allowable.

5.1.4 The following impurity elements shall not exceed these values:

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<https://standards.iteh.ai/catalog/standards/sist/549f604a-24d4-4e79-bda9-3ba83b4cf4d6/astm-c1462-21>