



Standard Test Method for The Determination of the Oxygen to Metal (O/M) Ratio in Sintered Mixed Oxide ((U, Pu)O₂) Pellets by Gravimetry¹

This standard is issued under the fixed designation C1817; 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 practice is an alternative method to Test Method C698 for the determination of the oxygen-to-metal atom ratio (O/M) in sintered mixed oxide fuel (MOX) pellets. The method presented in Test Method C698 is a one-step thermogravimetric method for determining O/M ratio in sintered MOX powders and pellets. As stated in Test Method C698, thermogravimetric methods using a two-step heating cycle are also satisfactory (1, 2).² The method presented in this test method is a two-step heating cycle method. This test method is applicable to sintered MOX pellets containing up to 10 weight percent PuO₂.

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 *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:³

C698 Test Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Mixed Oxides ((U, Pu)O₂)

C753 Specification for Nuclear-Grade, Sinterable Uranium Dioxide Powder

C757 Specification for Nuclear-Grade Plutonium Dioxide Powder, Sinterable

C833 Specification for Sintered (Uranium-Plutonium) Dioxide Pellets

C859 Terminology Relating to Nuclear Materials

C1068 Guide for Qualification of Measurement Methods by a Laboratory Within the Nuclear Industry

C1672 Test Method for Determination of Uranium or Plutonium Isotopic Composition or Concentration by the Total Evaporation Method Using a Thermal Ionization Mass Spectrometer

D1193 Specification for Reagent Water

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

2.2 ISO Standards:⁴

ISO 21484 Nuclear Fuel Technology – Determination of the O/M Ratio in MOX Pellets – Gravimetric Method – First Edition

3. Terminology

3.1 For definitions of terms used in this test method but not defined herein, refer to Terminology C859.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *average of the relative atomic mass*—the weighted average of the relative atomic mass of an element calculated as a function of its isotopic composition.

3.2.2 *mole fraction*—the ratio of the number of molecules (or moles) of a compound or element to the total number of molecules (or moles) present (Terminology D1356).

3.2.3 *MOX*—nuclear fuel composed of a mixture of uranium and plutonium oxides ((U, Pu)O₂).

3.2.4 *O/M*—ratio of the oxygen atoms divided by the metal atoms in the sample.

3.2.5 *relative atomic mass*—a dimensionless physical quantity, the ratio of the average mass of atoms of an element (from a single given sample or source) to 1/12 of the mass of an atom of carbon-12 (known as the unified atomic mass unit).

3.2.6 *scavenging*—the process of pushing a gas out by introducing a fresh flow in.

¹ This test method is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.05 on Methods of Test.

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² The boldface numbers in parentheses refer to a list of references at the end of this standard.

³ 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.

⁴ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, <http://www.iso.org>.