



Standard Test Methods for Analysis of Sintered Gadolinium Oxide-Uranium Dioxide Pellets¹

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1. Scope

1.1 These test methods cover procedures for the analysis of sintered gadolinium oxide-uranium dioxide pellets to determine compliance with specifications.

1.2 The analytical procedures appear in the following order:

	Sections
Carbon (Total) by Direct Combustion—Thermal Conductivity Method	2
C 1408 Test Method for Carbon (Total) in Uranium Oxide Powders and Pellets By Direct Combustion-Infrared Detection Method	3
Chlorine and Fluorine by Pyrohydrolysis Ion-Selective Electrode Method	16 to 22
Gadolinia Content by Energy-Dispersive X-Ray Spectrometry	23 to 32
Hydrogen by Inert Gas Fusion	33 to 40
Isotopic Uranium Composition by Multiple-Filament Surface-Ionization Mass Spectrometric Method	2
C 1413 Test Method for Isotopic Analysis Of Hydrolysed Uranium Hexafluoride And Uranyl Nitrate Solutions By Thermal Ionization Mass Spectrometry	3
Nitrogen by Distillation—Nessler Reagent (Photometric) Method	50 to 60
Oxygen-to-Metal Ratio of Sintered Gadolinium Oxide-Uranium Dioxide Pellets	61 to 70
Spectrochemical Determination of Trace Impurity Elements	71 to 77
Total Gas by Hot Vacuum Extraction	2
Ceramographic Determination of Free Gd ₂ O ₃ and Free UO ₂ to Estimate the Homogeneity of (U,Gd)O ₂ Pellets	86 to 93

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

1.4 *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:

- C 696 Test Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Uranium Dioxide Powders and Pellets³
- C 889 Test Methods for Chemical and Mass Spectrographic

Analysis of Nuclear-Grade Gadolinium Oxide (Gd₂O₃) Powder³

C 922 Specification for Sintered Gadolinium Oxide-Uranium Dioxide Pellets³

C 1347 Practice for Preparation and Dissolution of Uranium Materials for Analysis³

C 1408 Test Method for Carbon (Total) in Uranium Oxide Powders and Pellets By Direct Combustion-Infrared Detection Method³

C 1413 Test Method for Isotopic Analysis Of Hydrolysed Uranium Hexafluoride And Uranyl Nitrate Solutions By Thermal Ionization Mass Spectrometry³

D 1193 Specification for Reagent Water⁴

E 115 Practice for Photographic Processing in Optical Emission Spectrographic Analysis⁵

E 116 Practice for Photographic Photometry in Spectrochemical Analysis⁵

E 130 Practice for Designation of Shapes and Sizes of Graphite Electrodes⁵

E 146 Methods for Chemical Analysis of Zirconium and Zirconium Alloys⁵

3. Significance and Use

3.1 The test methods in this method are designed to show whether a given material is in accordance with Specification C 922.

4. Reagents

4.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the committee on Analytical Reagent of the American Chemical Society, where such specifications are available.⁶ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

¹ These test methods are under the jurisdiction of ASTM Committee C-26 on Nuclear Fuel Cycle and are the complete responsibility of Subcommittee C26.05 on Test Methods.

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² Discontinued 1999. See C 968–94.

³ *Annual Book of ASTM Standards*, Vol 12.01.

⁴ *Annual Book of ASTM Standards*, Vol 11.01.

⁵ *Annual Book of ASTM Standards*, Vol 03.05.

⁶ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.