



Designation: C 697 – 9804

Standard Test Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Plutonium Dioxide Powders and Pellets¹

This standard is issued under the fixed designation C 697; 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 These test methods cover procedures for the chemical, mass spectrometric, and spectrochemical analysis of nuclear-grade plutonium dioxide powders and pellets to determine compliance with specifications.

1.2 The analytical procedures appear in the following order:

Plutonium Sample Handling	Sections 8 to 10
Plutonium by Controlled-Potential Coulometry	2
~~Plutonium by Ceric Sulfate Titration~~	~~11 to 18~~
<u>Plutonium by Ceric Sulfate Titration</u>	3
Plutonium by Amperometric Titration with Iron(II)	2
Plutonium by Diode Array Spectrophotometry	3
~~Nitrogen by Distillation Spectrophotometry Using Nessler~~	~~19 to 26~~
~~—Reagent~~	
<u>Nitrogen by Distillation Spectrophotometry Using Nessler</u>	11 to 18
~~Reagent~~	
~~Carbon (Total) by Direct Combustion—Thermal Conductivity~~	~~27 to 38~~
<u>Carbon (Total) by Direct Combustion—Thermal Conductivity</u>	19 to 30
~~Total Chlorine and Fluorine by Pyrohydrolysis~~	~~39 to 46~~
<u>Total Chlorine and Fluorine by Pyrohydrolysis</u>	31 to 38
~~Sulfur by Distillation Spectrophotometry~~	~~47 to 55~~
<u>Sulfur by Distillation Spectrophotometry</u>	39 to 47
Plutonium Isotopic Analysis by Mass Spectrometry	4
~~Rare Earth Elements by Spectroscopy~~	~~56 to 63~~
<u>Rare Earth Elements by Spectroscopy</u>	48 to 55
~~Trace Elements by Carrier—Distillation Spectroscopy~~	~~64 to 71~~
<u>Trace Elements by Carrier—Distillation Spectroscopy</u>	56 to 63
Impurities by ICP-AES	
~~Impurity Elements by Spark-Source Mass Spectrography~~	~~72 to 78~~
<u>Impurity Elements by Spark-Source Mass Spectrography</u>	64 to 70
~~Moisture by the Coulometric Electrolytic Moisture Analyzer~~	~~79 to 86~~
<u>Moisture by the Coulometric Electrolytic Moisture Analyzer</u>	71 to 78
~~Total Gas in Reactor-Grade Plutonium Dioxide Pellets~~	~~87 to 94~~
<u>Total Gas in Reactor-Grade Plutonium Dioxide Pellets</u>	79 to 86
Plutonium-238 Isotopic Abundance by Alpha Spectrometry—95 to 102	
~~Americium-241 in Plutonium by Gamma-Ray Spectrometry~~	3
<u>Americium-241 in Plutonium by Gamma-Ray Spectrometry</u>	2
~~Rare Earths By Copper Spark Spectroscopy~~	~~103 to 112~~
<u>Rare Earths By Copper Spark Spectroscopy</u>	87 to 96
~~Plutonium Isotopic Analysis by Mass Spectrometry~~	~~113 to 121~~
<u>Plutonium Isotopic Analysis by Mass Spectrometry</u>	97 to 105
~~Oxygen-To-Metal Atom Ratio by Gravimetry~~	~~122 to 130~~
<u>Oxygen-To-Metal Atom Ratio by Gravimetry</u>	106 to 114

¹ These methods are under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and are the direct responsibility of Subcommittee C26.05 on Methods of Test.

Current edition approved Feb. 10, 1998; Jan. 1, 2004. Published May 1998; February 2004. Originally published as C 697—72, approved in 1972. Last previous edition approved in 1998 as C 697 – 928.