



Standard Test Methods for Chemical and Atomic Absorption Analysis of Uranium-Ore Concentrate¹

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1. Scope

1.1 These test methods cover procedures for the chemical and atomic absorption analysis of uranium-ore concentrates to determine compliance with the requirements prescribed in Specification C 967.

1.2 The analytical procedures appear in the following order:

	Sections
Uranium by Ferrous Sulfate Reduction—Potassium Dichromate Titrimetry	9 to 16
Nitric Acid-Insoluble Uranium	17 to 25
Extractable Organic Material	26 to 33
Arsenic by Diethyldithiocarbamate (Photometric Method)	34 to 43
Carbonate by CO ₂ Gravimetry	44 to 50
Fluoride by Ion-Selective Electrode	51 to 58
Halides by Volhard Titration	59 to 66
Moisture by Loss of Weight at 110°C	67 to 73
Phosphorus by Spectrophotometry	74 to 82
Silicon by Gravimetry	83 to 89
Thorium by the Thorin (Photometric) Method	90 to 98
Calcium, Iron, Magnesium, Molybdenum, Titanium, and Vanadium by Atomic Absorption Spectrophotometry	99 to 108
Potassium and Sodium by Atomic Absorption Spectrophotometry	109 to 118
Boron by Spectrophotometry	119 to 128

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.* Specific precautionary statements are given in Sections 7, 39, and Note 16.

2. Referenced Documents

2.1 ASTM Standards:

- C 761 Test Methods for Chemical, Mass Spectrometric, Spectrochemical, Nuclear, and Radiochemical Analysis of Uranium Hexafluoride²
- C 859 Terminology Relating to Nuclear Materials²
- C 967 Specification for Uranium Ore Concentrate²
- D 1193 Specification for Reagent Water³
- E 60 Practice for Photometric and Spectrophotometric

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

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² Annual Book of ASTM Standards, Vol 12.01.

³ Annual Book of ASTM Standards, Vol 11.01.

Methods for Chemical Analysis of Metals⁴

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods, refer to Terminology C 859.

4. Significance and Use

4.1 The test methods in this standard are designed to show whether a given material meets the specifications prescribed in Specification C 967.

4.2 Because of the variability of matrices of uranium-ore concentrate and the lack of suitable reference or calibration materials, the precision and bias of these test methods should be established by each individual laboratory that will use them. The precision and bias statements given for each test method are those reported by various laboratories and can be used as a guideline.

4.3 Instrumental test methods such as X-ray fluorescence and emission spectroscopy can be used for the determination of some impurities where such equipment is available.

5. Interferences

5.1 Interferences are identified in the individual test methods.

5.2 Ore concentrates are of a very variable nature; therefore, all interferences are very difficult to predict. The individual user should verify the applicability of each procedure for specific ore concentrates.

6. Reagents

6.1 *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 Reagents of the American Chemical Society, where such specifications are available.⁵ Other grades may be used, provided it is first ascertained that the reagent is of

⁴ Annual Book of ASTM Standards, Vol 03.05.

⁵ 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.