



Standard Test Method for The Analysis of Boron and Silicon in Uranium Hexafluoride via Fourier-Transform Infrared (FTIR) Spectroscopy¹

This standard is issued under the fixed designation C1842; 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 test method is suitable for determining boron and silicon impurities as BF_3 and SiF_4 in uranium hexafluoride. This test method is an alternative to those described in Test Methods C761 and C1771.

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:²

C761 Test Methods for Chemical, Mass Spectrometric, Spectrochemical, Nuclear, and Radiochemical Analysis of Uranium Hexafluoride

C787 Specification for Uranium Hexafluoride for Enrichment

C859 Terminology Relating to Nuclear Materials

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

C1052 Practice for Bulk Sampling of Liquid Uranium Hexafluoride

C1703 Practice for Sampling of Gaseous Uranium Hexafluoride

C1771 Test Method for Determination of Boron, Silicon, and Technetium in Hydrolyzed Uranium Hexafluoride by Inductively Coupled Plasma—Mass Spectrometer After Removal of Uranium by Solid Phase Extraction

2.2 Other Documents:

ANSI N14.1 Nuclear Materials – Uranium Hexafluoride – Packaging for Transport³

ISO 7195 Nuclear Energy – Packaging of Uranium Hexafluoride (UF_6) for Transport⁴

3. Terminology

3.1 Except as otherwise defined herein, definitions of terms are as given in Terminology C859.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *detection limit, n*—based on the minimum absorbance obtainable at a given pressure to yield a meaningful result. In accordance with Terminology C859, a low concentration level could be achieved with these methods.

3.2.2 *FTIR, n*—Fourier-transform infrared spectroscopy.

3.2.3 *K, n*—infrared absorbance constant in pressure units [1/Pa], $K = \text{OD/Pressure}$.

3.2.4 *“IS” container, n*—a nickel or Monel container as described in ANSI N14.1.

4. Summary of Test Method

4.1 To perform the Fourier-Transform Infrared (FTIR) spectroscopic analysis of boron and silicon impurities in uranium hexafluoride, a sample must be collected in a “IS” container or equivalent with the methods described in Practices C1052 or C1703.

4.2 The bottle is kept at room temperature. The manifold and the sample cell are maintained at 50°C. In these conditions, UF_6 is mainly in solid phase in the bottle and boron and silicon are present in the gaseous phase of manifold. In this medium, the boron and silicon chemical forms are respectively BF_3 and SiF_4 .

4.3 The test method is based on the analysis in the gas phase. The gas phase is analyzed at 50°C by FTIR spectrometry to determine the B and Si concentration in uranium hexafluoride.

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.

Current edition approved June 1, 2016. Published July 2016. DOI: 10.1520/C1842-16.

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.

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 International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.