



Standard Practice for Dissolution of UF₆ from P-10 Tubes^{1,2}

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1. Scope

1.1 This practice covers the dissolution of UF₆ from a P-10 tube to provide solutions for analysis.

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.* For specific safeguard and safety precaution statements, see Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*³

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

C787 Specification for Uranium Hexafluoride for Enrichment

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

D1193 Specification for Reagent Water

3. Summary of Practice

3.1 UF₆ samples intended for analysis are packaged in P-10 tubes to prevent sublimation and reaction with moisture in the air. The P-10 tube assembly (Fig. 1) consists of a Polychlorotrifluoroethylene (PCTFE) tube containing the UF₆, a PCTFE

¹ This practice 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 Polychlorotrifluoroethylene P-10 tubes are widely accepted by the industry for subsample collection and subsequent UF₆ quality analyses or dispatch to the customer. The procedure for subsample collection and dissolution can also be used for other types of subsample tubes, for example, P-20, P-80 or P-100, in that case the amount of water has to be adjusted to ensure complete hydrolysis of UF₆ and avoid excessive heat evolution.

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.

gasket to cover the tube's opening, and a nut and plug (Monel or SS) to seal the gasket to the tube.

3.2 The UF₆ tube is weighed, cooled in liquid nitrogen, and quickly opened and immersed in water for dissolution. The pieces of the tube's assembly are removed from the resulting solution, rinsed, dried, reassembled, and weighed. The solution is dried for gravimetric conversion to U₃O₈, or diluted to an appropriate concentration for dispensing into aliquots for subsequent analysis.

4. Significance and Use

4.1 Uranium hexafluoride is a basic material used to prepare nuclear reactor fuel. To be suitable for this purpose the material must meet criteria for uranium content, isotopic composition and metallic impurities in Specification C787 and C996. This practice results in the complete dissolution of the sample for uranium and impurities analysis, and determination of isotopic distribution by mass spectrometry as described in, for example, Test Methods C761.

5. Apparatus

5.1 *Steam bath*, in a hood, if optional step 9.2.13 is used.

5.2 *Vacuum oven*, if option 2 of 9.2.14 is used. The oven should be adjustable to 80°C at an absolute pressure of 3×10^3 Pa.

5.3 *Dewar flask*, wide-mouth.

5.4 *Vise*, small lab-bench model or similar type of holder.

5.5 *Wrench*, ¹⁵/₁₆ in.

5.6 *Plastic clamping forceps*, 12 to 13 cm long, with a claw-like bent tip, to securely hold the cylindrical PCTFE tube.

NOTE 1—These forceps are not commercially available. Bend the ends of a straight-tip forceps by heating over a moderate flame, shaping, and maintaining the shape until cool.

5.7 *TFE-fluorocarbon-coated spatula*, 0.5- to 1-cm wide at its flat end, optional.

5.8 *Platinum or PCTFE rod*, optional.

5.9 *Platinum dishes or plastic beakers with compatible HF resistance (typically Polyethylene; PE)*, large enough to contain a completely submerged P-10 tube.