
**Nuclear fuel technology — Alpha
spectrometry —**

Part 2:

**Determination of plutonium in uranium
and its compounds**

Technologie du combustible nucléaire — Spectrométrie alpha —

Partie 2: Détermination du plutonium dans l'uranium et ses composés



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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 21847-2 was prepared by Technical Committee ISO/TC 85, *Nuclear energy*, Subcommittee SC 5, *Nuclear fuel technology*.

ISO 21847 consists of the following parts under the general title *Nuclear fuel technology — Alpha spectrometry*:

- *Part 1: Determination of neptunium in uranium and its compounds*
- *Part 2: Determination of plutonium in uranium and its compounds*
- *Part 3: Determination of uranium 232 in uranium and its compounds*

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Nuclear fuel technology — Alpha spectrometry —

Part 2:

Determination of plutonium in uranium and its compounds

1 Scope

This part of ISO 21847 describes a method for determining trace amounts of ^{238}Pu and $^{239}\text{Pu} + ^{240}\text{Pu}$ in uranium hexafluoride, uranium oxides or uranyl nitrate.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

3 Principle

UF_6 samples are hydrolyzed, and solid samples are dissolved.

Pu(VI) and Pu(IV) are reduced to Pu(III) by hydroxylamine hydrochloride. The Pu(III) is then oxidized to Pu(IV) by sodium nitrite. The Pu(IV) is extracted by thenoyltrifluoroacetone and measured by alpha spectrometry.

NOTE Impurities adversely affect the Pu reduction/oxidation cycle and can modify the extraction efficiency.

4 Reagents and materials

Use reagents of recognized analytical grade.

4.1 Water, at least quality 1 as specified in ISO 3696.

4.2 Nitric acid, concentrated, $c(\text{HNO}_3) = 15,8 \text{ mol/l}$.

4.3 Nitric acid, $c(\text{HNO}_3) = 10 \text{ mol/l}$.

4.4 Nitric acid, dilute, $c(\text{HNO}_3) = 0,8 \text{ mol/l}$.

4.5 Thenoyltrifluoroacetone, (TTA; $\text{C}_8\text{H}_5\text{F}_3\text{O}_2\text{S}$) solution in xylene, $c(\text{C}_8\text{H}_5\text{F}_3\text{O}_2\text{S}) = 0,5 \text{ mol/l}$.

Prepare the solution weekly. Equilibrate the solution with dilute **nitric acid** (4.4).

4.6 Hydroxylamine hydrochloride, $c(\text{ClH}_4\text{NO}) = 3 \text{ mol/l}$.