INTERNATIONAL STANDARD

ISO 21483

First edition
2013-11-01

Determination of solubility in nitric acid of plutonium in unirradiated mixed oxide fuel pellets (U, Pu) O2

Détermination de la solubilité dans l'acide nitrique du plutonium des pastilles (U, Pu) O2 de combustibles d'oxydes mixtes non irradiés

Reference number
ISO 21483:2013(E)

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Published in Switzerland

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Foreword

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The committee responsible for this document is ISO/TC 85, *Nuclear energy, nuclear technologies and radiological protection*, Subcommittee SC 5, *Nuclear fuel cycle*.

This first edition of ISO 21483 cancels and replaces ISO 12184:1994, which has been technically revised.

Determination of solubility in nitric acid of plutonium in unirradiated mixed oxide fuel pellets (U, Pu) O2

1 Scope

This International Standard specifies an analytical method for determining the solubility in nitric acid of plutonium in pellets of unirradiated mixed oxide fuel (light-water reactor fuels). The results provide information about the expected dissolution behaviour of irradiated pellets under industrial reprocessing conditions. In this aspect, the specific conditions (e.g. time of the test) may vary depending upon the need to match to a specific reprocessor's requirements. The test is aimed at determining solubility under equilibrium conditions rather than the kinetics of dissolution and hence allows for a second dissolution period.

2 Principle

A specified number of mixed oxide pellets of known plutonium content and mass are dissolved in a boiling nitric acid solution. The initial concentration of the nitric acid, the final content of U, Pu and the boiling time are carefully controlled. The undissolved residue is then dissolved quantitatively by boiling in a mixture of nitric acid and hydrofluoric acid. The plutonium content of this residue is determined by an appropriate analytical method. The solubility is expressed by the ratio of the amount of plutonium dissolved in nitric acid to the amount of plutonium in the sample.

3 Interferences

The dissolution apparatus (Clause 5) and the reagents shall not be contaminated with fluoride, as fluoride can cause an increase in the solubility of the pellets in nitric acid.

4 Reagents

Use only reagents of analytical grade and distilled or demineralised water or water of equivalent purity. Prepare the reagents in compliance with the local laboratory safety instructions.

4.1 Concentrated nitric acid

ρ = 1,40 g/ml or more

4.2 Nitric acid high

Solution [$c(HNO_3)$ = 10 mol/l]

4.3 Nitric acid low

Solution [$c(HNO_3)$ = 0,5 mol/l].

4.4 Concentrated hydrofluoric acid

ρ = 1,13 g/ml

4.5 Mixture of acid

Nitric acid, solution [$c(HNO_3)$ = 14,4 mol/l] and hydrofluoric acid, solution [c(HF) = 0,05 mol/l].