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Nuclear Energy — Fuel technology — Determination of the O/M ratio in MOX pellets by the gravimetric method

Énergie nucléaire — Technologie du combustible — Détermination du rapport O/M dans les pastilles MOX par la méthode gravimétrique

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Foreword

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection,* Subcommittee SC 5*, Nuclear installations, processes and technologies*.

This second edition cancels and replaces the first edition (ISO 21484:2008), which has been technically revised.

Nuclear Energy — Fuel technology — Determination of the O/M ratio in MOX pellets by the gravimetric method

1 Scope

This document describes a method for determining the Oxygen-to-Metal (O/M) ratio in mixed uranium-plutonium oxide $(U,Pu)O_{2 \pm X}$ pellets. The parameters given in the following paragraphs are relevant for pellets within a range of O/M ratio corresponding to 1,98 to 2,01. The method described in the document is adapted, with regard to the parameters, if the expected values of O/M ratio are outside the range.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

The $(U,Pu)O_{2 \pm X}$ sample is submitted to controlled oxidation-reduction under thermodynamic conditions designed to change the O/M ratio to a value of 2,000. The initial stoichiometric deviation, X, is determined from the sample mass difference before and after heat treatment.

5 Reactions

The main reactions are as follows:

a) $(U,Pu)O_{2 \pm X} \pm {}^{x}/_{2}\ O_2 \rightarrow (U,Pu)O_{2,000}$;

b) $(U,Pu)O_{2+x} + xH_2 \rightarrow (U,Pu)O_{2,000} + xH_2O$.

6 Reagents and materials

During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and distilled or demineralized water or water of equivalent purity.

6.1 Nitric acid solution, 50 % per volume nitric acid aqueous solution.

6.2 Purge gas.

6.2.1 Air, a volume fraction of 99,99 % purity grade is recommended.

6.2.2 Inert gas, such as Argon or nitrogen can be used with a recommended volume fraction of 99,99 % purity grade [O_2 < 0,000 5 % (5 ppm), H_2O < 0,000 5 % (5 ppm), N_2 < 0,000 5 % (5 ppm)].