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Nuclear energy — Determination of Gd_2O_3 content in gadolinium fuel blends and gadolinium fuel pellets by atomic emission spectrometry using an inductively coupled plasma source (ICP-AES)

Énergie nucléaire — Dosage de Gd_2O_3 dans des mélanges de poudres et dans des pastilles combustibles au gadolinium par spectrométrie par émission atomique à plasma à couplage inductif (ICP-AES)

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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ISO 16796 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 16796:2004), which has been technically revised.

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Nuclear energy — Determination of Gd_2O_3 content in gadolinium fuel blends and gadolinium fuel pellets by atomic emission spectrometry using an inductively coupled plasma source (ICP-AES)

1 Scope

This document is applicable to the determination of gadolinium as Gd_2O_3 in powder blends and sintered pellets of Gd_2O_3 + UO_2 and ((U, Gd) O_2) from mass fraction 10 g/kg to 100 g/kg (i.e. 1 % to 10 %), using a suitable ICP-AES instrument.

This methodology is capable of demonstrating compliance with agreed upon fuel specifications and associated data quality objectives provided the user has performed qualification measurements under their established measurement control program to demonstrate that measurement uncertainty requirements will be met with the desired level of confidence at the specification.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 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 https://www.iso.org/obp

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

4 Principle

The test sample is weighed and dissolved in nitric acid. The test sample solutions are aspirated into an inductively coupled plasma using argon as a carrier. The emitted light from the test sample in the plasma is dispersed, and the gadolinium line at 335,0 nm is measured by a spectrometer.

The intensity of the gadolinium line is proportional to the concentration of gadolinium present.

Impurity interferences have not been observed for the usual test samples of the nuclear grade material.

5 Apparatus

5.1 Inductively coupled plasma atomic emission spectrometer (ICP-AES). A typical value for resolution is 0,555 nm/mm in the first order.

5.2 Analytical balance; sensitivity ±0,1 mg.

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