

Irish Standard I.S. EN ISO 15646:2016

Re-sintering test for UO2, (U,Gd)O2 and (U,Pu)O2 pellets (ISO 15646:2014)

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I.S. EN ISO 15646:2016

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National Foreword

I.S. EN ISO 15646:2016 is the adopted Irish version of the European Document EN ISO 15646:2016, Resintering test for UO2, (U,Gd)O2 and (U,Pu)O2 pellets (ISO 15646:2014)

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EUROPEAN STANDARD NORME EUROPÉENNE

EN ISO 15646

EUROPÄISCHE NORM

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English Version

Re-sintering test for UO2, (U,Gd)O2 and (U,Pu)O2 pellets (ISO 15646:2014)

Test de refrittage pour pastilles UO2, (U,Gd)O2 et (U,Pu)O2 (ISO 15646:2014) Nachsintertest für U02-, (U,Gd)02- und (U,Pu)02-Pellets (ISO 15646:2014)

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EN ISO 15646:2016 (E)

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European foreword

The text of ISO 15646:2014 has been prepared by Technical Committee ISO/TC 85 "Nuclear energy, nuclear technologies, and radiological protection" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 15646:2016 by Technical Committee CEN/TC 430 "Nuclear energy, nuclear technologies, and radiological protection" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.

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INTERNATIONAL STANDARD

ISO 15646

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Re-sintering test for UO₂, (U,Gd)O₂ and (U,Pu)O₂ pellets

Test de refrittage pour pastilles UO_2 , $(U,Gd)O_2$ et $(U,Pu)O_2$



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ISO 15646:2014(E)

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*.

Re-sintering test for UO₂, (U,Gd)O₂ and (U,Pu)O₂ pellets

1 Scope

This International Standard describes a procedure for measuring the densification of UO_2 , $(U,Gd)O_2$, and $(U,Pu)O_2$ pellets, achieved by heat treatment under defined conditions.

The densification of fuel in power operation is an important design feature. Essentially, it is dependent on structural parameters such as pore size, spatial pore distribution, grain size, and in the case of (U,Gd) O_2 and (U,Pu) O_2 , oxide phase structure. A thermal re-sintering test can be used to characterize the dimensional behaviour of the pellets under high temperature. The results of this test are used by the fuel designer to predict dimensional behaviour in the reactor, because thermal densification in the reactor is also dependent on these structural parameters, albeit in a differing manner in terms of quantity.

On the assumption of the prediction, it is necessary to correlate the results of this test by some correlation rules, because the results of this test vastly depend on the re-sintering conditions (such as heat treatment temperature, treatment time, gas content, and partial oxygen pressure).

2 Brief description of procedure

The density of nuclear fuel pellets is measured before the re-sintering test. Afterwards, the pellets are subjected to heat treatment in a furnace under specified conditions with regard to temperature, time, and sintering atmosphere. After cooling, the density is remeasured.

The oxygen/metal molar ratio should remain constant during the re-sintering test. The difference between the two density measurements shall be used to assess the thermal stability of the pellet lot.

3 Incidents

Minor chipping can occur during pellet handling. Densities of visibly chipped pellets shall not be measured using the geometric method, as the results will be inaccurate.

Densities of such chipped pellets can be measured using the buoyancy method.

4 Apparatus

Specifically for (U,Pu)O₂, all operations shall be performed in glove boxes.

4.1 Equipment for measuring density

The same method shall be used before and after the re-sintering of pellets.

In <u>4.1.1</u> and <u>4.1.2</u>, two different measurement methods are mentioned as examples. Other methods can be used if they meet the customer uncertainty requirement.

4.1.1 Geometric measurement of density

A dial test indicator or micrometer with precision of $1\,\mu m$ shall be used in order to measure the diameter and the height.

Analytical balance with readability of ± 1 mg for weighing the pellets.



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