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Nuclear energy — Standard method for testing the long-term alpha irradiation stability of matrices for solidification of high-level radioactive waste

Énergie nucléaire — Méthode d'essai normalisée de la stabilité à long terme à l'irradiation alpha des matrices de confinement des déchets radioactifs de haute activité

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 6962 was prepared by Technical Committee ISO/TC 85, *Nuclear energy*, Subcommittee SC 5, *Nuclear fuel technology*.

This second edition cancels and replaces the first edition (ISO 6962:1982), which has been technically revised.

Introduction

It is generally agreed that a solid is the best form in which to store or dispose of highly radioactive waste (High Level Waste: HLW) from the first stage of a nuclear fuel reprocessing plant. This solid will usually be in the form of blocks having the mass of several hundred kilograms, cast or formed in a steel container. The solid will receive a large dose of radiation or every kind and it is important that this radiation should not significantly alter the properties of the solid for very long periods of time. Thus, proposed compositions must be tested to ensure their radiation stability.

Although the β-decays of the fission products will far out-number the α-decays of the incorporated actinides, most of the energy of the β particles (electrons) is dissipated by ionization of the atoms in their path and this will only have a transient effect. On the other hand, almost all the atom displacements in the solid will be caused by the α-decays, with the recoiling actinide nuclei being responsible for the great majority of these. Alpha-decays generates helium and helium atoms are a foreign body in solids. During long-term storage, helium pressure within the solids is built up to some atmospheres. Thus, it is the stability of the solid to α-decays that must be tested.

Nuclear energy — Standard method for testing the long-term alpha irradiation stability of matrices for solidification of high-level radioactive waste

1 Scope

This International Standard specifies a method designed to check the long-term stability of a solid to alpha disintegration by detection of all modifications in the properties of an irradiated sample.

The material favoured hitherto is a borosilicate glass, but possible alternatives include:

— ceramics or glass-ceramics,

— other glass compositions.

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 16797, *Nuclear energy — Soxhlet-mode chemical durability test — Application to vitrified matrixes for high-level radioactive waste*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
radioactive waste
any residue containing radioactive materials not currently considered useful or economically recoverable

3.2
package
waste package
product of conditioning that includes the waste form as well as any container(s) and internal barriers (e.g. shielding materials and liner), as prepared in accordance with requirements for handling, transportation, storage and/or disposal

3.3
waste form
waste in its physical and chemical form after treatment or conditioning prior to packaging and which is a component of the waste package

3.4
container
outer shell of a waste package