
**Nuclear energy — Determination
of chlorine and fluorine in uranium
dioxide powder and sintered pellets**

*Énergie nucléaire — Détermination du chlore et du fluor dans les
poudres de dioxyde d'uranium et les pastilles frittées*



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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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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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 22875:2008), which has been technically revised with the following changes:

- pyrohydrolysis temperature is lowered;
- information has been added concerning decomposition of species including fluoride and chloride (see footnote 2);
- calculation of the result takes into account pyrohydrolysis yield if needed.

Introduction

This document describes a method for determining the chlorine and fluorine concentrations in uranium dioxide and in sintered fuel pellets by pyrohydrolysis of samples, followed either by liquid ion-exchange chromatography or by selective electrode measurement of chlorine and fluorine ions.

Many ion chromatography systems and ion-selective electrode measurement systems are available. The equipment and operating procedure are, therefore, not described in detail.

Nuclear energy — Determination of chlorine and fluorine in uranium dioxide powder and sintered pellets

1 Scope

This document describes a method for determining chlorine and fluorine in uranium dioxide powder and sintered pellets. It is applicable for the measurement of samples with a mass fraction of chlorine from 5 µg/g to 500 µg/g and with a mass fraction of fluorine from 2 µg/g to 500 µg/g.

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*

ISO 9892:1992, *Uranium metal, uranium dioxide powder and pellets, and uranyl nitrate solutions — Determination of fluorine content — Fluoride ion selective electrode method*

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Principle

The samples are pyrohydrolysed at 850 °C to 1 000 °C in a tubular furnace with steam or moist air or moist oxygen heated to the same temperature. Chlorine and fluorine are trapped as halogenated acids and entrained in an aqueous solution.

Two measurement methods may be used to measure the chlorine and fluorine ions:

- a) liquid ion chromatography;
- b) ion-selective electrode.

5 Reagents

Use reagents of recognized analytical grade.

5.1 Water, complying with at least grade 1 in accordance with ISO 3696.

5.2 Anhydrous sodium chloride (NaCl).

5.3 Anhydrous sodium fluoride (NaF).