



SLOVENSKI STANDARD SIST EN ISO 24459:2023

01-september-2023

Ugotavljanje vsebnosti urana v vzorcih iz jedrskega gorivnega cikla z L- absorpcijsko robno spektrometrijo (ISO 24459:2021)

Determination of uranium content in samples coming from the nuclear fuel cycle by L-
absorption edge spectrometry (ISO 24459:2021)

Bestimmung von Uran in Lösungen des Kernbrennstoffkreislaufs - L-
Absorptionskantenspektrometrie (ISO 24459:2021)

Détermination de la quantité d'uranium dans des échantillons du cycle du combustible
nucléaire par spectrométrie de discontinuité d'absorption L (ISO 24459:2021)

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English Version

Determination of uranium content in samples coming from the nuclear fuel cycle by L-absorption edge spectrometry (ISO 24459:2021)

Détermination de la quantité d'uranium dans des échantillons du cycle du combustible nucléaire par spectrométrie de discontinuité d'absorption L (ISO 24459:2021)

Bestimmung von Uran in Lösungen des Kernbrennstoffkreislaufs - L-Absorptionskantenspektrometrie (ISO 24459:2021)

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European foreword

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Endorsement notice

The text of ISO 24459:2021 has been approved by CEN as EN ISO 24459:2023 without any modification.

INTERNATIONAL
STANDARD

ISO
24459

First edition
2021-10

**Determination of uranium content
in samples coming from the nuclear
fuel cycle by L-absorption edge
spectrometry**

*Détermination de l'uranium dans les solutions du cycle du
combustible nucléaire par absorption de rayons X à la discontinuité L*

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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ISO 24459:2021(E)

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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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radio protection*, Subcommittee SC 5, *Analytical methodology in the nuclear fuel cycle*.

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Determination of uranium content in samples coming from the nuclear fuel cycle by L-absorption edge spectrometry

1 Scope

This document specifies a method for the determination of uranium concentrations in nitric acid or TBP-DILUANT (for example TBP-kerosene) solutions coming from the nuclear fuel cycle.

The method is applicable

- for process control of solutions, free of suspension, which contain between 10 g/l to 300 g/l uranium, and
- for high accuracy purposes (Safeguards) to nitric acid solutions, free of suspension, which contain between 100 g/l and 220 g/l uranium.

Having

- the content of neptunium and plutonium impurities in the solution less than 1 % of the uranium content.
- the content of neutron poisons (gadolinium, erbium) less than 1 % of the uranium content to ensure the absence of significant interferences at the level of required precision, for high accuracy purposes.

The method is applicable to solid samples as well, provided that they can be fully dissolved in nitric acid.

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 <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Principle

A highly collimated X-ray beam passes through a uranium solution with well-defined path length. The transmission spectrum is recorded with a solid-state detector. A sharp jump of the photon transmission, which is related to the concentration of uranium, occurs at the L-edge energy of uranium ($E_{LIII} = 17,17$ keV). Uranium concentration is determined from the size of the jump using calibration and spectrum processing algorithms.

The proposed spectrum processing algorithms require the acquisition of reference spectrum to cancel out the influence of the matrix.

For high accuracy measurement, the isotopic composition of uranium and the temperature shall be known and corrections may apply.