International Standard

ISO 20289

Surface chemical analysis — Total reflection X-ray fluorescence analysis of water

Analyse chimique des surfaces — Analyse par fluorescence de rayons X en réflexion totale d'eau

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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 document 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 201, *Surface Chemical Analysis*, Subcommittee SC 10, *X-ray Reflectometry (XRR) and X-ray Fluorescence (XRF) Analysis*.

This second edition cancels and replaces the first edition (ISO 20289:2018) which has been technically revised.

The main changes are as follows:

— updated Clause 2 and bibliography;

— editorial changes and correction of verbal forms;

— revision of Annex A removing the use of relative uncertainty;

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Total reflection X-ray fluorescence (TXRF) spectroscopy is a surface sensitive technique which can be used to obtain compositional information about different kinds of samples. ISO/TS 18507 provides guidelines for the characterization of biological and environmental samples with TXRF.

TXRF is suitable for quantitative elemental analysis of liquid samples deposited as thin films on clean and well-polished reflectors, by means of internal standard calibration[1][2].

This document provides guidance and requirements for the quantitative elemental analysis of water by means of TXRF instrumentation.

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Surface chemical analysis — Total reflection X-ray fluorescence analysis of water

1 Scope

This document specifies a chemical method for technicians working with total reflection X-ray fluorescence (TXRF) instrumentation to perform measurements of water samples, according to good practices, with a defined degree of accuracy and precision. Target users are identified among laboratories performing routine analysis of large numbers of samples, which also conform with ISO/IEC 17025.

This document specifies a method to determine the content of elements dissolved in water (e.g. drinking water, surface water and ground water). This document is also applicable for determining elements in waste waters and eluates, taking into account the specific and additionally occurring interferences. This document does not specify sampling, dilution and pre-concentration methods.

Elements determined using the method specified in this document can depend on the X-ray source of the instrument. This document does not specify health, safety or commercial aspects.

The determinable concentrations depend on the matrix and the interferences encountered. In drinking water and relatively unpolluted waters, the limit of quantification lies between 0,001 mg/l and 0,01 mg/l for most of the elements. The range of concentrations typically lies between 0,001 mg/l and 10 mg/l, depending on the element and predefined requirements.

Annex A reports an example of uncertainty calculation. Annex B provides an example report on validation of the method for TXRF analysis of water performed with instrumentation that has Mo as the X-ray source and uses Ga as the internal calibration standard.

Limits of quantification of most elements are affected by blank contamination and depend predominantly on the laboratory air-handling facilities available, on the purity of reagents and the cleanliness of labware.

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/TS 18507:2015, *Surface chemical analysis — Use of Total Reflection X-ray Fluorescence spectroscopy in biological and environmental analysis*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 18507 and the following apply.

ISO and IEC maintain terminology 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/

3.1
calibration standard
known standard solutions, prepared from the primary dilution solution or stock solutions, containing the elements of interest or the internal standard element

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