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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

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

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 the 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.

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

1 Scope

This document provides 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 comply with ISO/IEC 17025.

This document specifies a method to determine the content of elements dissolved in water (for example, drinking water, surface water and ground water). Taking into account the specific and additionally occurring interferences, elements can also be determined in waste waters and eluates. Sampling, dilution and pre-concentration methods are not included in this document.

Elements that can be determined with the present method may change according to the X-ray source of the instrument. No health, safety or commercial aspects are considered herewith.

The working range depends 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 working range typically covers concentrations between 0,001 mg/l and 10 mg/l, depending on the element and predefined requirements.

Annex B reports, for example, the complete validation of the method of TXRF analysis of water performed with instrumentation that has Mo as the X-ray source and uses Ga as the internal standard for calibration.

Quantification limits 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 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 5667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques*

ISO 5667-3, *Water quality — Sampling — Part 3: Guidance on the preservation and handling of water samples*

ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

ISO 14706, *Surface chemical analysis — Determination of surface elemental contamination on silicon wafers by total-reflection X-ray fluorescence (TXRF) spectroscopy*