ISO/~~DIS~~FDIS 18227~~:2025(en)~~

ISO/TC 190/SC 3~~/WG 1~~

~~Date: 2025-07-09~~

Secretariat: DIN

Date: 2025-08-28

Environmental solid matrices — Determination of elemental composition by X-ray fluorescence spectrometry

Matrices solides environnementales — Détermination de la composition élémentaire par spectrométrie de fluorescence X

FDIS stage

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Published in Switzerland

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

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical and physical characterization*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 444, *Environmental characterization of solid matrices,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 18227:2014), which has been technically revised.

The main changes are as follows:

— ~~—~~the contents of the two almost identical standards ISO 18277:2014 and EN 15309:2007 have been combined;

— ~~—~~normative references have been revised.

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.

Introduction

X-ray fluorescence (XRF) spectrometry is a fast and reliable method for the quantitative analysis of the total content of certain elements within different matrices.

The quality of the results obtained depends very closely on the type of instrument used, e.g. bench top or high performance, energy dispersive or wavelength dispersive instruments. When selecting a specific instrument several factors should be considered, such as the matrices to be analysed, elements to be determined, detection limits required and the measuring time. The quality of the results depends on the element to be determined and on the surrounding matrix.

Due to the wide range of matrix compositions and the lack of suitable reference materials in the case of inhomogeneous matrices such as waste, it is generally difficult to set up a calibration with matrix- matched reference materials.

Therefore, this ~~standard~~document describes two different procedures:

— ~~—~~a quantitative analytical procedure required for homogeneous solid waste, soil and soil-like material, where the calibration is based on matrix-matched standards;

— ~~—~~an optional XRF screening method for solid and liquid material as waste, sludge and soil in Annex A~~Annex A~~ which provides a total element characterization at a semi-quantitative level, where the calibration is based on matrix-independent calibration curves, previously set up by the manufacturer.

Environmental solid matrices — Determination of elemental composition by X-ray fluorescence spectrometry

1 Scope

This document specifies the procedure for a quantitative determination of major and trace element concentrations in homogeneous solid waste, soil, soil-like material and sludge by energy dispersive X-ray fluorescence (EDXRF) spectrometry or wavelength dispersive X-ray fluorescence (WDXRF) spectrometry using a calibration with matrix-matched standards.

This document is applicable for the following elements: Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Br, Rb, Sr, Y, Zr, Nb, Mo, Ag, Cd, Sn, Sb, Te, I, Cs, Ba, Ta, W, Hg, Tl, Pb, Bi, Th and U. Concentration levels between a mass fraction of approximately 0,000 1 % and 100 % can be determined depending on the element and the instrument used.

An optional XRF screening method for solid and liquid material as waste, sludge and soil is added in Annex A~~Annex A~~ which provides a total element characterization at a semi-quantitative level, where the calibration is based on matrix-independent calibration curves, previously set up by the manufacturer.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 ~~3.1~~
absorption edge
jump of the mass absorption coefficient at a specific wavelength or energy

3.2 ~~3.2~~
analytical line
specific characteristic X-ray spectral line of the atom or ion of the analyte used for determination of the analyte content

3.3 ~~3.3~~
continuous radiation
electromagnetic radiation produced by the acceleration of a charged particle, such as an electron, when deflected by another charged particle, such as an atomic nucleus