

Solid recovered fuels - Determination of elemental composition by X-ray fluorescence (ISO 22940:2021)

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Solid recovered fuels - Determination of elemental composition by X-ray fluorescence (ISO 22940:2021)

Combustibles solides de récupération - Détermination de la composition élémentaire par fluorescence de rayons X (ISO 22940:2021)

Feste Sekundärbrennstoffe - Bestimmung der Elementzusammensetzung durch Röntgenfluoreszenz (ISO 22940:2021)

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN ISO 22940:2021) has been prepared by Technical Committee ISO/TC 300 "Solid recovered materials, including solid recovered fuels" in collaboration with Technical Committee CEN/TC 343 "Solid Recovered Fuels" the secretariat of which is held by SFS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2022, and conflicting national standards shall be withdrawn at the latest by March 2022.

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Endorsement notice

The text of ISO 22940:2021 has been approved by CEN as EN ISO 22940:2021 without any modification.

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols and abbreviated terms	3
4.1 Symbols.....	3
4.2 Abbreviated terms.....	4
5 Safety remarks	4
6 Principle	4
7 Apparatus	4
8 Interferences and sources of error	5
9 Sample preparation	5
9.1 Preparation principles.....	5
9.2 Drying of general analysis sample material.....	5
9.3 Preparation of pressed pellet.....	6
10 Procedure	6
10.1 Analytical measurement conditions.....	6
10.1.1 Wavelength-dispersive instruments.....	6
10.1.2 Energy-dispersive instruments.....	7
10.1.3 Intensities and background corrections.....	7
10.2 Calibration.....	8
10.2.1 General.....	8
10.2.2 General calibration procedure.....	8
10.2.3 Calibration procedure using the pressed pellet method (recommended method).....	9
10.3 Procedures for correcting matrix effects.....	10
10.3.1 General.....	10
10.3.2 Internal standard correction using Compton (incoherent) scattering method.....	10
10.3.3 Fundamental parameter approach.....	10
10.3.4 Fundamental or theoretical influence coefficient method.....	10
10.3.5 Empirical alpha correction.....	11
10.4 Analysis of the samples.....	11
11 Quality control	12
11.1 Drift correction procedure.....	12
11.2 Reference materials and quality control samples.....	12
12 Calculation of the result	12
13 Performance characteristics	13
14 Test report	13
Annex A (informative) Publicly available solid recovered fuel reference materials	14
Annex B (informative) Validation	15
Bibliography	38

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 300, *Solid recovered materials, including solid recovered fuels*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 343, *Solid Recovered Fuels*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Introduction

X-ray fluorescence spectrometry can be used as a fast method for a qualitative overview of ash forming elements and impurities. When calibration is based on reference materials or on matrix-matched homogeneous solid recovered fuel samples with known content, X-ray fluorescence spectrometry can be used for a quantitative analysis of the total content of the specified elements within different solid recovered fuels.

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 need to be considered, such as the matrices to be analysed, elements to be determined, detection limits required and the measuring time.

Due to the wide range of matrix compositions and the lack of suitable reference materials in the case of solid recovered fuels from various origin, it is generally difficult to set up a calibration with matrix-matched reference materials. Therefore, it is important to use several homogenized solid recovered fuel samples with properties that sufficiently match the matrices of interest and whose content has been derived by independent measurement techniques, for example total digestion of solid recovered fuels and characterization of major and minor elements by measurement of digestion solutions with ICP-MS or ICP-OES, or by other techniques such as elemental analysis using combustion technology on sulfur or by combustion and ion chromatographic determination for chlorine.

This document describes two different procedures:

- 1) Quantitative analytical procedure for major elements of solid recovered fuels. The calibration is based on different reference materials and solid recovered fuel samples with known content.

The elements described as major elements of solid recovered fuels are in fact major elements of the fuel ashes more than of the fuels. The determination of these elements can be helpful to predict the melting behaviour and slagging of the ashes. Moreover, contamination of fuel with sand or soil is indicated by high values of several elements.

- 2) Total element characterization at a semiquantitative level for major and minor elements of solid recovered fuels. The calibration is based on matrix-independent calibration curves, previously set up by the manufacturer.

In general, the sensitivity of X-ray fluorescence is not sufficient for a determination of the content of minor elements (trace metals) in solid recovered fuels. However, it is possible to use determination of minor elements after calibration with solid recovered fuel samples with known content or at a semiquantitative level based on matrix-independent calibration curves to collect data for higher sample numbers, taking into account lower achievable precision. Therefore, it may be used to reveal excessive contents of minor elements in solid recovered fuels.

Solid recovered fuels — Determination of elemental composition by X-ray fluorescence

1 Scope

This document specifies the procedure for a determination of major and minor element concentrations in solid recovered fuel material by energy-dispersive X-ray fluorescence (EDXRF) spectrometry or wavelength-dispersive X-ray fluorescence (WDXRF) spectrometry using a calibration with solid recovered fuel reference materials or solid recovered fuel samples with known content. A semiquantitative determination can be carried out using matrix independent standards.

This document is applicable to the following elements: Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Br, Mo, Cd, Sb, Sn, Tl and Pb. Concentration levels between approximately 0,000 1 % and 100 % can be determined depending on the element, the calibration materials used and the instrument used.

NOTE X-ray fluorescence spectrometry can be used as a fast method for a qualitative overview of elements and impurities and after suitable calibration it is very useful for determining major elements or even minor elements (except Hg) in order to quickly identify increased concentrations of minor elements in solid recovered fuels (SRF), for example during SRF-production.

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 21637, *Solid recovered fuels — Vocabulary*

ISO 21646,¹⁾ *Solid recovered fuels — Sample preparation*

ISO 21660-3, *Solid recovered fuels — Determination of moisture content using the oven dry method — Part 3: Moisture in general analysis sample*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21637 and the following apply.

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 <http://www.electropedia.org/>

3.1

absorption edge

abrupt change in mass absorption coefficient at a specific wavelength or energy

3.2

absorption

loss of intensity of X-rays due to isotropic and homogenous material, as described by the Beer-Lambert law

1) Under preparation. Stage at the time of publication: ISO/DIS 21646:2021.